THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXI. No. 1816.] LONDON, MARCH 1, 1898. [50TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.

THOMAS ALLAN & SONS,

Bonlea Foundry,

SOUTH STOCKTON-ON-TEES.

Formerly Springbank Iron-Works, Glasgow.

ESTABLISHED 1848.

ALSO MANUFACTURERS OF

SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

Telegrams: "BONLEA, STOCKTON-ON-TEES."

Lanemark Coal Co.,

LIMITED.

LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on Application to

LANEMARK COLLIERY,

NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

— ESTABLISHED 1830. —

PARKER & LESTER,

Manufacturers & Contractors.

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT,

Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores, for Gas and Water Works.

WORKS:

ORMSIDE STREET, OLD KENT ROAD, LONDON.

'BEAR CREEK' CANNEL

LOG MOUNTAIN COAL, COKE, AND TIMBER CO. PINEVILLE, KENTUCKY, U.S.A.

Cable Address: "HULL, PINEVILLE." Codes used "ABC" & "A1."

Communications to the Company only.

Wrought-Iron

And Fittings and Accessories.

LAMBERT BROS., WALSALL,

MANUFACTURERS OF

WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.

BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF WARNER'S PATENT MARKET GAS STAND-PIPE.

LONDON: LAMBETH BRASS & IRON CO., Ltd., Short St., LAMBETH.

BIGGS, WALL, & CO.,

GAS AND WATER ENGINEERS,

49, FANN STREET,

LONDON, E.C.

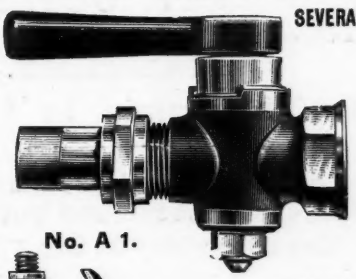
No. 50.

INCANDESCENT STREET LAMPS A SPECIALITY.

WRITE FOR OUR **PRICE LISTS** OF

FULL-WAY MAIN TAPS & LANTERN TAPS.

SEVERAL DESIGNS SHOWN BELOW.



No. A 1.

THESE TAPS ARE

FULL-WAY

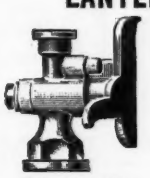
AS SHOWN.

SUPERIOR QUALITY AND FINISH IN GUN METAL.

No. A 1.

LANTERN TAPS.

No. B 10.



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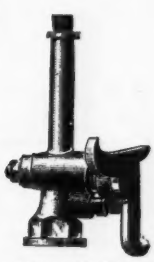
No. A 12.



No. A 11.

SAWER & PURVES, NELSON METER WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

IMPROVED WET GAS-METERS IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

IMPROVED DRY GAS-METERS.

Speciality: PATENT CASH PREPAYMENT METERS.

CATALOGUE SENT ON APPLICATION.

HISLOP'S PATENT REGENERATIVE RETORT-SETTINGS

THESE SETTINGS SECURE THE RECORD PRODUCTION OF

1000

DURABILITY AND SIMPLICITY OF MANAGEMENT. LOWEST POSSIBLE FUEL ACCOUNT. PERFECT SATISFACTION GUARANTEED.

CUBIC FEET OF GAS PER LINEAL FOOT OF RETORT (Ordinary Section) per 24 HOURS from ENGLISH COAL, and

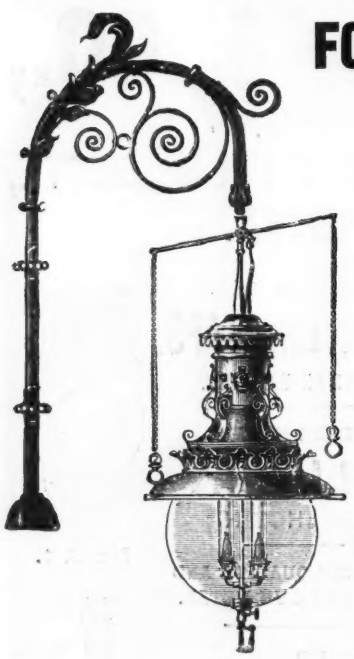
1200 CUBIC FEET FROM SCOTCH COAL,

Together with every other possible Advantage.

AGENTS: *Messrs. JONAS DRAKE & SON, Gas Engineers, Halifax, Yorkshire, for* ENGLAND, WALES *and* ABROAD. *C. M. HAMILTON, Retort Setter, Hamilton, for* SCOTLAND *and* IRELAND. *Enquiries may be addressed in the first instance, to the* PRINCIPAL AGENT:
R. F. HISLOP, Gas Engineer, CRAIGIELEA, PAISLEY.

THE "VERITAS" GAS ARC LANTERN

FOR INCANDESCENT GAS-LIGHT.



UNSURPASSED
FOR
OUTDOOR AND INDOOR LIGHTING.
WIND AND RAIN PROOF.
SHADOWLESS.
ENAMELLED STEEL THROUGHOUT.
INDESTRUCTIBLE.
NO BREAKAGE OF MANTLES.

Thousands in Use.

Write for Illustrated Catalogue, with special Lighting Patterns as supplied to London Vestries, and many Towns throughout the United Kingdom.

FALK, STADELMANN, & CO., Limited,

VERITAS LAMP WORKS,

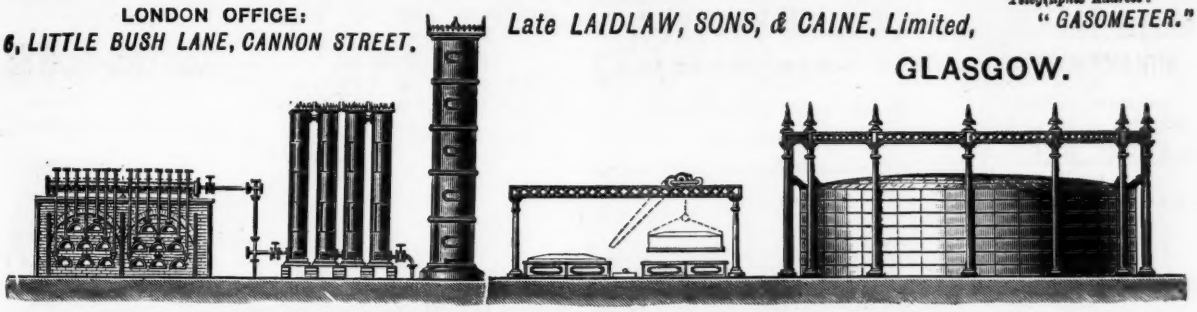
83, 85, & 87, FARRINGDON ROAD, LONDON, E.C.

THE BARROWFIELD IRON-WORKS, LIMITED,

LONDON OFFICE:
6, LITTLE BUSH LANE, CANNON STREET.

Late LAIDLAW, SONS, & CAINE, Limited,
GLASGOW.

Telegraphic Address:
"GASOMETER."



MANUFACTURERS OF ALL KINDS OF GAS PLANT.

RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
CONDENSERS, EXHAUSTERS, AND ENGINES; SCRUBBERS, WASHERS;
PURIFIERS, WITH PLANED AND CEMENT JOINTS;
DRY AND HYDRAULIC CENTRE-VALVES;
HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
GASHOLDERS, SINGLE-LIFT & TELESCOPE; CAST & WROUGHT-IRON TANKS;
STATION METERS; GOVERNORS; SCREW AND RACK VALVES;
FOUR-WAY COCKS AND HYDRAULIC VALVES;
CAST-IRON GAS, WATER, & STEAM PIPES & CONNECTIONS; WROUGHT-IRON TUBES & FITTINGS;
IRON ROOFING, MARKET BUILDINGS, BRIDGES, GIRDERS, STEAM BOILERS;
PROMENADE PIERS AND LOADING WHARVES.

MANUFACTURERS OF OIL PLANT OF EVERY DESCRIPTION.

HENDERSON'S Patent Retorts, Condensers, Stills, Cast and Wrought Iron Tanks, Ammonia Stills, Wrought-Iron Gas-Mains, &c., &c.

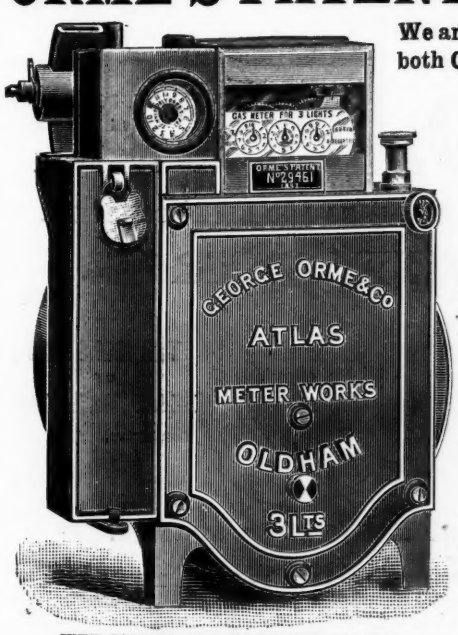
DESCRIPTIVE SPECIFICATIONS AND ESTIMATES ON APPLICATION.

GEORGE ORME & CO.

ATLAS METER WORKS, OLDHAM.

Manufacturers of

ORME'S PATENT IMPROVED COIN METER.



WET COIN METER IN CAST-IRON CASE.

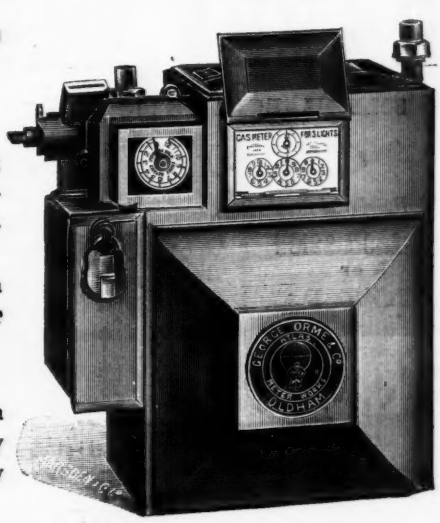
We are now supplying our Wet Coin Meters in Cast-Iron and Tin-Plate Cases, both Ordinary and Compensating; also Dry Coin Meters in Tin-Plate Cases.

A large number of these Meters are in use, and giving satisfaction.

The Mechanism is very simple; and there are no springs or complicated parts to get out of order.

We supply them to work with **1d., 1s., or any other Coin desired.**

The Selling Price of Gas can be changed *in Situ*, and any number of feet delivered, as may be required.



DRY COIN METER IN TIN-PLATE CASE.

Any further Particulars sent upon application.

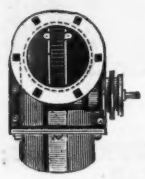
Telegraphic Address: "ORME, OLDHAM." Telephone: No. 93, Oldham.

NEWTON, CHAMBERS, & CO., LIMITED,

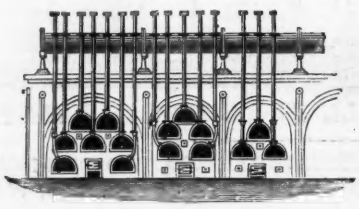
THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

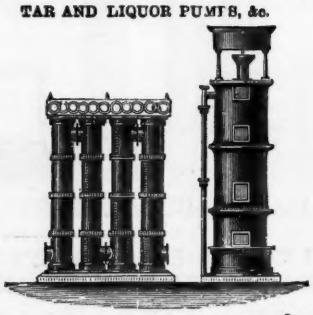
SLIDE VALVES,
WITH RACK & PINION
OR
Internal or External
SCREWS of all sizes.
GASHOLDERS,
AND
Gasholder Tanks.



CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description,
Iron Roofs, Columns, Girders, Floor Plates,
Tools, &c.

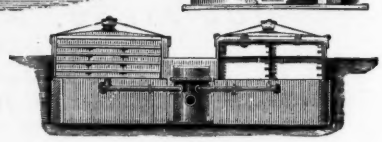


WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.



PATENT
CENTRE-VALVES
for working Purifiers,
Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS, and SPECIALS.
WOOD GRIDS.
CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

JOHN BROWN & CO., LTD., SHEFFIELD.

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

BARRY, HENRY, & CO., LTD.,

ABERDEEN, SCOTLAND,
and
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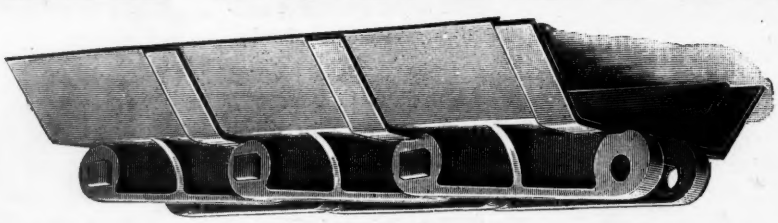
SOLE MAKERS OF HACK & PIGGOTT'S PATENT COKE-CONVEYING PANS AND LINKS COMBINED.

COKE-CONVEYORS.

Specialities:

TRANSMISSION
OF
POWER.

Rope and Belt Pulleys,
Spur and Bevel Wheels,
Shafting and Couplings,
Pedestals, and Fixings.



Specialities.

TRANSMISSION
OF
MATERIALS.

Conveyors,
Elevators,
Grinding Machinery,
Motors.

The only Coke-Conveyor which has proved a thorough success.

ALSO HACK AND GILE'S PATENT CONVEYOR PAN LINKS.

WRITE FOR PRICES AND PARTICULARS.

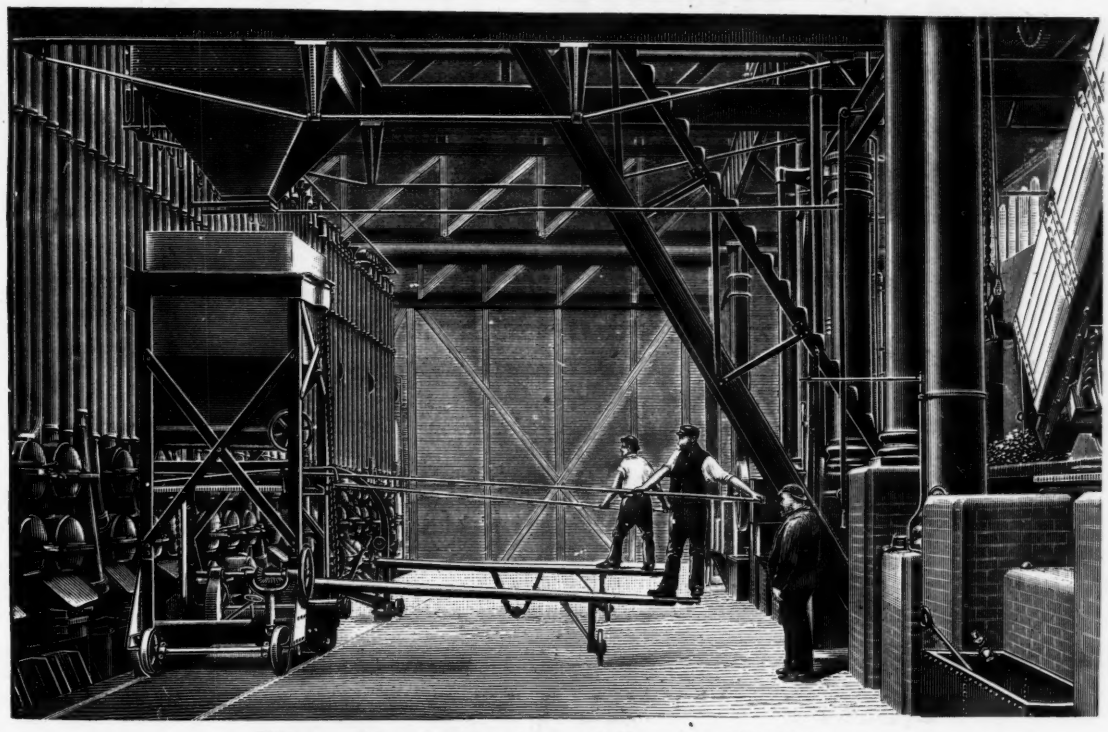
The fullest Inquiry invited. Can be seen at work in some of the principal Gas-Works in the United Kingdom, where they are giving the utmost satisfaction.

WEST'S GAS IMPROVEMENT CO., LTD.

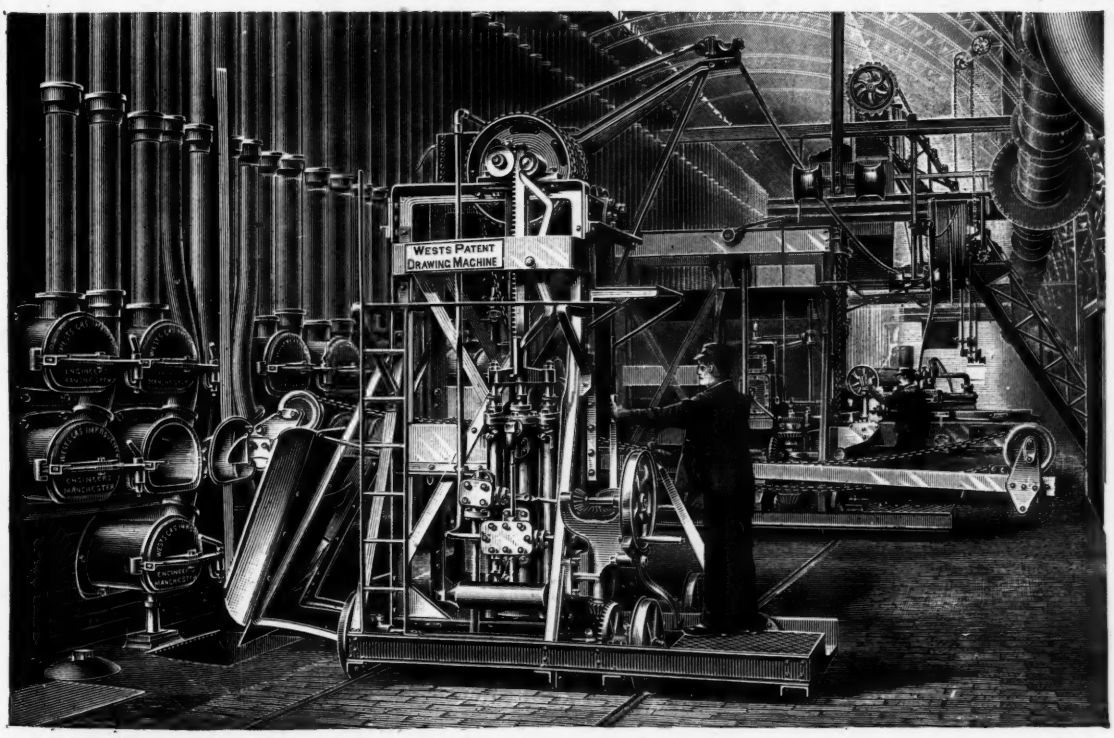
ALBION IRON-WORKS, MILES PLATTING,

MANCHESTER;

And 104, Queen Victoria Street, London, E.C.



West's Manual Charging and Drawing Machines.



West's Compressed-Air Drawing and Charging Machines.

Contractors for

WEST'S REGENERATOR SETTINGS & RETORT-HOUSE PLANT.

TELEGRAMS: "FIRECLAY," LEEDS. TELEPHONE No. 612.

COAL and COKE Breakers, Elevators, AND Conveyors.

RETORTS, Bricks, Blocks, Tiles, &c.

ENGINEERS IRONFOUNDERS CONTRACTORS MANUFACTURERS

EVERY DESCRIPTION OF

RETORT SETTINGS AND IRONWORK.

WE GUARANTEE RESULTS.

BUILDINGS, ROOFS.

RE-SETTING RETORTS.

We desire to call attention to our SHALLOW REGENERATIVE SETTINGS, which are comparatively inexpensive to erect, and productive of excellent results. They are specially designed to suit those Retort Houses where for various reasons it is undesirable to excavate to any great depth.

We shall be pleased to furnish Designs and Estimates on application.

THE LEEDS FIRECLAY CO. LTD., ENGINEERING DEPARTMENT, WORTLEY, nr. LEEDS.

THE "TRAFALGAR"

PREPAYMENT GAS-METER

FOR PENCE, SHILLINGS, OR ANY COINAGE.

THE ADVANTAGES OF THIS SYSTEM ARE:

1. Simplicity of Mechanism.
2. Absolute Accuracy.
3. Impossibility of being tampered with.
4. Unaffected by irregularities in shape or thickness of the penny.
5. Can be fixed to any ordinary Wet or Dry Meter.
6. Extra large Money-Box.
7. Price Changer can be altered without otherwise disturbing the Meter.
8. Index showing number of Pennies in the mechanism at any time.
9. Rejection of Half-Pennies certain.

GUARANTEED FOR FIVE YEARS.

FRANK WRIGHT'S PREPAYMENT GAS-METER CORPORATION, Limited,

Telegraphic Address: "Gasometer, London." Manufacturers of Wet and Dry Gas-Meters. Offices and Works: 62, GLENGALL ROAD, S.E. Telephone No. 59 Peckham.

IMPROVEMENTS IN STREET LIGHTING.

Highest Efficiency with Greatest Economy.

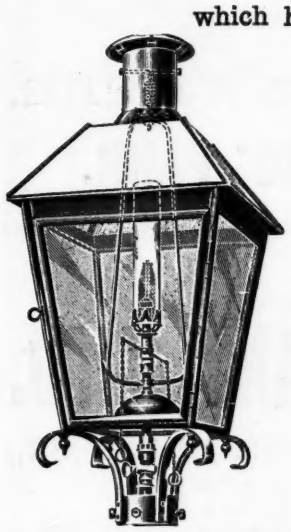
LIGHTING AUTHORITIES, GAS ENGINEERS, and GAS MANAGERS

are invited to inspect the

INCANDESCENT GAS-LIGHT

(Welsbach System),

which has now been successfully adapted to the purposes of

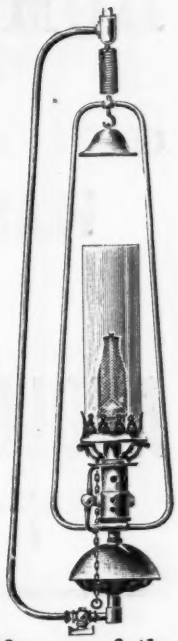


STREET LIGHTING,

the difficulties caused by VIBRATION having been OVERCOME by the use of the

NEW SPRING SUSPENSION FRAME (Patent).

This System of Lighting meets the requirements of all Lighting Authorities in those Districts where it is desired to effect an Improvement in Street Lighting WITHOUT INCREASE OF EXPENDITURE.



The following are Extracts from a PAPER read by Mr. F. G. DEXTER, before the SOUTHERN DISTRICT ASSOCIATION.

"The success of the experimental (Welsbach) lighting secured the contract for one of the Parish Council Districts; and this was shortly followed by the contract for three years for the city lamps. The total represents altogether about 500 single lamps, and 15 refuge lamps containing two lights."

"In the matter of maintenance of the street lights, the record is favourable—in fact, more so than the estimate provided. By the test-meter, the average daily consumption works out to 38 cubic feet per light, including bye-pass. The bye-pass consumes with a flame half an inch long, $\frac{1}{5}$ foot per hour. This represents 1000 cubic feet per lamp per annum. The average consumption per light, when in use, works out to 12,900 feet per annum, or about $3\frac{3}{5}$ feet per light per hour. The lighting is continued all the year round, from the average times of one hour after sunset to one hour before sunrise."

"The mantles have worked out to an average of three per lamp per annum; but, bearing in mind the absence of frost last winter, the writer believes that four mantles per light is more likely to represent average conditions."

"In the matter of cleaning, it may be said that the lanterns require less attention than with the ordinary flat-flame burner."

"The number of lights attended to per man averages 85."

"The 'Welsbach' Light is undoubtedly one of the greatest aids to successful competition that the Gas Industry has ever experienced. Its influence, while reducing the relative cost of light, has advanced the consumption of gas all over the country by the increased satisfaction of the existing consumers, and the attraction of others. The writer feels that its influence should not be confined to the house. It is capable of meeting every competitor in the street, from cheap oils to arc lights, in cost and in effect; and it is hoped that the foregoing experience may lead many others to seek its aid and to realize its efficiency."

FOR PRICES AND PARTICULARS, APPLY TO THE

INCANDESCENT GAS-LIGHT CO., Ltd.,

Palmer Street, Westminster, London.

OIL FOR GAS MAKING

PURE DISTILLATE.

HOMOGENEOUS IN CHARACTER.

NO MIXTURE.

CAN BE STORED SAFELY ANYWHERE.

FLASH POINT GUARANTEED OVER 200° FAHR.

(ABEL'S CLOSED TEST.)

ANGLO-CAUCASIAN OIL COMPANY, LTD.

18 & 19, GT. ST. HELEN'S, LONDON. | INDIA BUILDINGS, CROSS ST., MANCHESTER.

COLUMNLESS HOLDERS.

Notwithstanding the antagonistic influence of firms who are not permitted to construct Holders on **GADD & MASON'S PATENT SPIRAL GUIDE SYSTEM,** their adoption grows larger every year. Intelligent Gas Engineers appreciate the **GREATER SAFETY** of these Holders, and the very great **SAVING IN COST** of from **20** to **30 PER CENT.** No first-class Engineer should now think of paying for so much Metal in the shape of Columns, and the Labour of Erection.

Some time ago the "JOURNAL OF GAS LIGHTING" referred to

"THE KNELL OF GASHOLDER GUIDE-FRAMING,"

which speaks volumes.

In order to meet the ever-increasing demand, we have granted **Licenses for the construction of our patent System of Holders to a select few of the leading Gasholder Makers,** from whom Estimates and Particulars can be obtained.

Gas Engineers are enjoined to avoid Firms who talk twaddle about Columns giving greater strength, merely in order to obtain an Extra Price for the weight of Metal therein and the Labour in Erection. Prices of Materials and Labour are constantly advancing—a sufficient reason why all Engineers should place their orders with Firms who can give them our Holders, and so save considerably in first cost, as well as Repairs, besides getting a **STRONGER, SAFER,** and a **BETTER SYSTEM.**

The first Gadd and Mason Holder was erected some Nine Years ago at Northwich. It has withstood the most violent Storms (one of which brought down the chimney stack); and we believe up to now has not cost a single fraction for Repairs.

THE PATENT GASHOLDER SYNDICATE, 504, Stockport Rd., MANCHESTER.

ARROL-FOULIS

PATENT HYDRAULIC MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS

SIR WILLIAM ARROL & CO., Ltd., Sole Makers,
DALMARNOCK IRON-WORKS, BRIDGETON,
GLASGOW.

LONDON ADDRESS: 32, VICTORIA STREET, WESTMINSTER, S.W.

PLANS AND ESTIMATES FURNISHED ON APPLICATION.

THE **ARROL-FOULIS** MACHINES Are Employed at the following Works—

GLASGOW GAS-WORKS—
Tradeston.
Dawsholm.
Dalmarnock.

GASLIGHT & COKE COMPANY—
Beckton.

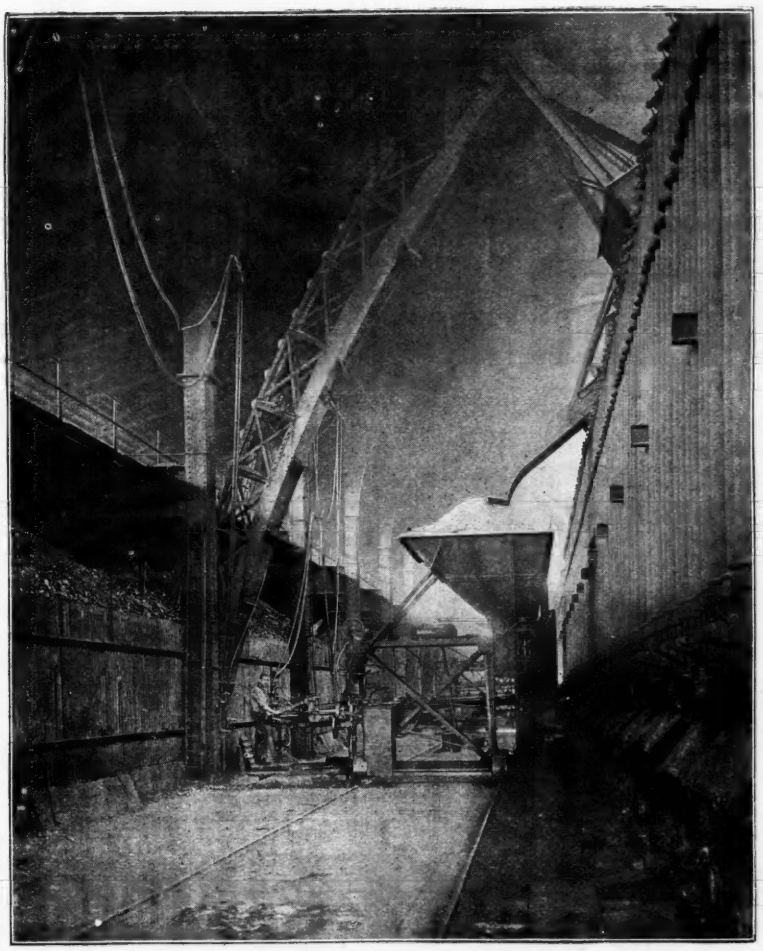
SOUTH METROPOLITAN GAS COMPANY—
East Greenwich
Vauxhall.
Rotherhithe.

COMMERCIAL GAS-WORKS—
Wapping.
Poplar.

BROMLEY GAS-WORKS (KENT).

EDINBURGH GAS-WORKS.

LIVERPOOL GAS-WORKS.



THE **ARROL-FOULIS** MACHINES Are Employed at the following Works—

LEEDS GAS-WORKS.

BIRMINGHAM GAS-WORKS.

BRITISH GAS CO.—
Hull.

BOLTON GAS-WORKS.

IMPERIAL CONTINENTAL GAS ASSOCIATION—
Amsterdam.
Vienna.

HAGUE CORPORATION GAS-WORKS—
Hague.

METROPOLITAN GAS-WORKS—
Melbourne.

CLEVELAND GAS-WORKS—
Cleveland, Ohio, &c., &c., &c.

OVER 200 MACHINES ARE AT WORK OR IN COURSE OF CONSTRUCTION.

BECKTON GAS-WORKS.

THE TIME TAKEN TO DRAW AND CHARGE EACH RETORT BY THESE MACHINES AVERAGES

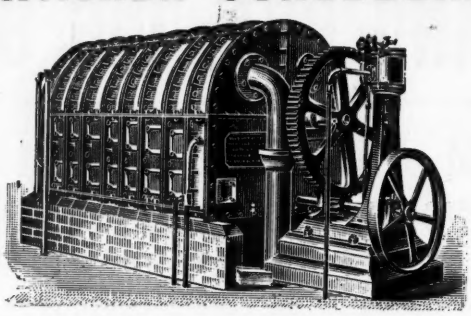
ONE MINUTE.

KIRKHAM, HULETT, & CHANDLER, LD.

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

PATENT "STANDARD" WASHER-SCRUBBER.

This Apparatus upholds its title, the "STANDARD;" being recognized by leading Engineers as the most efficient Apparatus for the Extraction of Ammonia from Coal or other Gases.



The Largest Order ever given for WASHER-SCRUBBERS was recently received being for **16** Patent "Standard" Washer-Scrubbers, each for 3,500,000 Cubic Feet of Gas per day.

Number of Patent "STANDARD" Washer-Scrubbers in use at this date

540

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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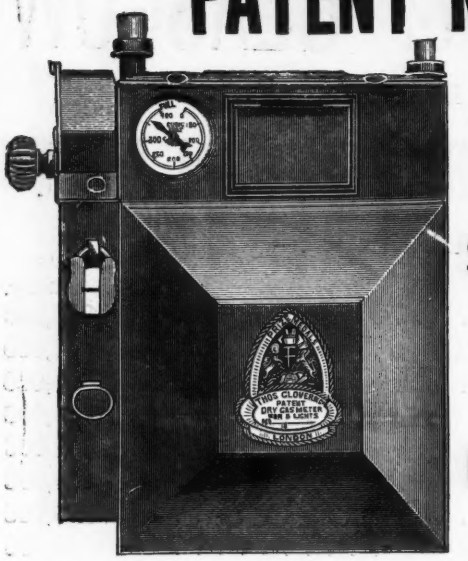

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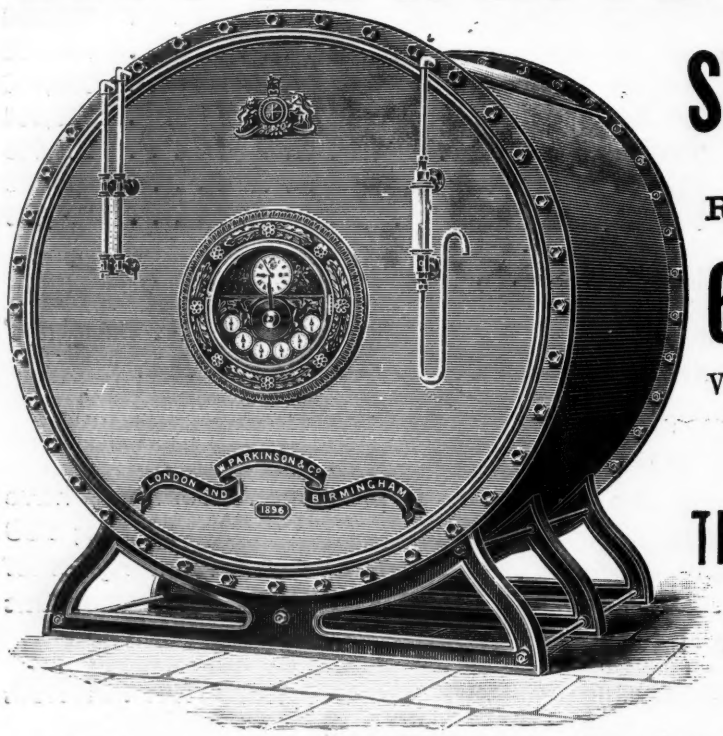

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EDITORIAL NOTES.

Defence of, and Opposition to, The Gaslight and Coke Company's Bill.

WHEN discussing last week the prospects of The Gaslight and Coke Company's Bill, we remarked that no official reply had been given to Mr. De la Hooke's criticism of the provisions of the measure. It is only right to state that in "The Times" the same day—Tuesday, the 22nd ult.—there appeared a letter of Colonel Makins, the Governor of the Company, which bore the date of Feb. 14, that of the publication of Mr. De la Hooke's letter. Why the insertion of this communication was so long delayed is not for us to divine; but at any rate it is only fair to Colonel Makins to draw attention to the dates of these letters. Colonel Makins charges Mr. De la Hooke with incorrectly stating the objects of the measure. He describes the Bill as primarily a Consolidation Bill—"a mere measure of "consolidation and simplification." He points out that Mr. De la Hooke, in his criticism of the Bill, "has either "forgotten or omitted to describe the action of the auction "clauses of the Acts under which all new capital since 1876 "is raised." It is further asserted that the auction clauses completely put an end to the "extraordinarily favourable "conditions" granted by the Legislature to Gas Companies, by rendering all fresh capital issuable only at the market value of the day. Very fairly, with regard to Mr. De la Hooke's contention that if the present Bill is passed the original conditions of gas supply legislation will be quite lost to sight, Colonel Makins observes that the County Council and the Corporation may be trusted to put the whole case for the consumer before Parliament whenever the Gas Companies apply for new powers. The letter concludes with the declaration: "Our Bill is only intended "to simplify our accounts, and to put an end to a fiction "which makes the ordinary capital appear to return interest "at 12 to 13 per cent., instead of 4 per cent., the actual "rate obtained. As regards the consumers' interests the "Bill makes no alteration."

Meanwhile, the London County Council at their last meeting before the election took the necessary steps to enable the Bill to be opposed under the Borough Funds Act. The Chairman of the Parliamentary Committee explained that, according to the calculations of the Comptroller of the Council, the Bill would enhance the capital value of the stocks affected by not less than a million pounds sterling. The Committee did not wish to oppose the Conversion Bill merely on this account, said the Chairman; but mainly because it would be more difficult to procure from Parliament concessions to consumers from a Company paying 5 per cent. dividends than from one paying 12¾ per cent. The discussion showed that The Gaslight and Coke Company had but two friends in the whole body of the Council. Lord Onslow and Mr. Beachcroft confessed that the South Metropolitan Stock Consolidation Bill would not have been allowed to pass unopposed but for the concessions made to consumers and employees of the Company in regard to purchasing stock. Lord Onslow was willing to give The Gaslight and Coke Company a chance of doing the same thing; but he was prevented by the legal form of the proceedings. Mr. Beachcroft accused the Company of having "grossly mismanaged their "business." Sir T. G. Fardell, a retiring member, characterized the Bill as "the most impudent proposition that "had ever been brought forward by a public Company." Colonel Makins has expressed dislike of "irresponsible" criticism; but this is a kind of criticism that is likely to produce results.

Two District Association Meetings.

LAST week two District Associations of Gas Managers held meetings, both productive of a considerable quantity of technical literature. The Midland Association met on Thursday in Birmingham, under the presidency of Mr. J. T. Lewis, of Wellingborough, whose lengthy Inaugural Address we give elsewhere. Mr. Lewis took a generous estimate of his opportunity as President, and gave his hearers the benefit of his views regarding a number of topics of a good general character which are not usually discussed at these local gatherings. He did not, however, neglect concrete matters, and contributed a further piece of evidence to prove that the cause of that bugbear of most gas managers, stopped ascension-pipes, may frequently be found in the state of the hydraulic main. Mr. Lewis also gave some extremely valuable figures relating to the prime

cost and the working of carbonizing plant. His criticism as to the comparative merits of horizontal and inclined retort systems is intelligent, although scarcely conclusive. He is no doubt quite justified in stating that it is very difficult, in attempting comparisons of the kind, to make sure that the conditions are truly equal or comparable on both sides. The complete story of carbonization in inclined retorts has not yet been told; but, for all that, it is somewhat astonishing to hear from Mr. Lewis that he cannot find any saving of labour with the inclined retorts. Of course, if he gets his carbonizing done with the aid of manual machinery for something considerably less than 2s. per ton, the inclined retort systems, usually established on a much larger scale, may have a difficulty in beating his record. These, however, are not the figures which the ordinary revenue accounts of gas undertakings commonly furnish. Mr. Lewis's criticism of carburetted water gas, as an auxiliary of coal gas manufacture, is sound. His observations on the advantages of consolidating small gas-works in particular districts are well worthy of the attention of those interested in this class of gas property. The same may be said of the tale of the Wellingborough experiments in the direction of popularizing gas. Altogether, the address bears the impress of much thought and careful preparation; and its quality justifies the selection of the author to preside over the Midland Association. After the address, which was very well received, Mr. Thomas Glover, of West Bromwich, read a paper on "Acetylene Gas," which was in every respect a creditable introduction of the new illuminant to a meeting of gas managers. The last bit of technical business done at the meeting was the consideration of a communication from the Committee of the North British Association of Gas Managers respecting a proposed conference on the standardizing of meter unions.

At the meeting on Saturday of the Manchester District Institution of Gas Engineers, the President, Mr. W. S. Haddock, of Warrington, read a practical address, in which the question of selecting gas coals bulks largely. He gave a detailed statement of the sources and characteristics of the local coal supply. It appears from the address that every known method of gas enrichment is practised somewhere in the district covered by the Institution, which is a notable state of things. Mr. Haddock is able to testify that the extensive choice of enrichment methods at the command of gas undertakings has had a powerful influence upon the market value of high-grade cannel. The President had nothing to say concerning his own carbonizing experience; but he offered some points for consideration in regard to purification. Warrington, moreover, appears to be a place where the working of a tar-still for the local produce has proved successful. The address contains some useful information respecting the working of coin-freed gas-meters, loyally contributed by members of the Institution, who deserve the thanks of the profession for their trouble in this regard. Two papers—one by Mr. H. Kendrick, of Stretford, on "An Experience with Dry Mains," the other by Mr. Townsend, of Wakefield, on "Emergencies"—completed the business of a very full meeting.

Withdrawal of the Electric Lighting Clauses of the Tottenham and Edmonton Bill.

The half-yearly general meeting of the Tottenham and Edmonton Gas Company was held on Saturday, Mr. Corbet Woodall in the chair. The progress of this undertaking is an interesting study, marked as it is by a succession of new developments. For this is a Gas Company which is in the fullest sense of the term managed—things are not allowed to drift along anyhow, with the complacent assumption on the part of the Board that nothing matters because the price of gas can always be raised. One of the novel schemes taken in hand by the Directors with a view to the benefit of the district and of the Company does not, however, look like succeeding for the time being. The electric lighting clauses inserted in the Company's Bill have been withdrawn, in deference to an objection to the form of procedure raised by the Chairman of Committees of the House of Lords. We summarized the purport of these clauses in our notice of the Bill (*ante*, p. 122), stating that "the clauses of an ordinary Electric Lighting Order are "included in the Bill." Now that the formal objection has been taken, we must say we should have been greatly surprised if this part of the Bill had been allowed to stand. All the existing electric light legislation has been done through the Board of Trade; and there is no reason why the electricity supply of Tottenham and Edmonton should be otherwise dealt with. But it was worth trying, perhaps, as the Company were applying to Parliament; and the attempt to save money and time in this way has not done any harm. But from the moment we saw the Bill, we confess to have had small hope of it going forward with a complete Electric Lighting Order inside it. Of course, the withdrawal of these clauses is not a question of policy. The Board of Trade will be ready to discuss the terms of an Electric Lighting Order for Tottenham and Edmonton at the instance of the Gas Company in the regular way. The proper course for a Gas Company to take in this connection is to ask Parliament for permission to make application to the Board of Trade for an Electric Lighting Order, and to use the capital of the Company for the purpose of such application, and for carrying out the Order if and when granted. The present example shows that more than this cannot really be done by an ordinary Gas Company's Bill.

The London County Council Elections.

The preparations for the London County Council elections are being pressed forward; and before long it will be settled in what spirit the affairs of the greatest city in the world are to be ruled during the next three years. After all that has been said and done with regard to the desirability of keeping party politics out of municipal bodies, London has fallen in with the prevailing current; and the forthcoming election will be almost wholly on party lines. Of course, each side abuses the other for lending itself to this way of settling the composition of such a body as the London County Council; but the truth really is that the thing was unavoidable. It has become increasingly manifest that the direction of the main lines of policy of the Council coincided with the party divisions of the membership. It will be as well to frankly accept the conclusion. After all, as Dr. G. B. Longstaff has pointed out in a letter to "The Times," the question of the direction of the main lines of the policy even of a local authority—apart from points of detail—is essentially a political one. Thus the main issues of the forthcoming London County Council elections are "whether in London Muni-"cipal Socialism is to prevail over private enterprise; "whether in London monopolies are to be confiscated or "controlled; whether in London the Trade Unions are "to be alone considered in all labour questions, to the ex-"clusion of the ratepayers; whether in London central-"ization is to crush out local self-government." Dr. Longstaff submits that these are political questions, and that as such they should be settled by the face-to-face contest of the two political parties. The principles having been determined in this way, the details of administration can be ordered independently of party politics.

We shall see how the first overtly political London County Council turns out. As we have already recognized, the gas supply is not a specific bone of contention between the parties, though it figures among the "mono-"polies" which one party offers to confiscate and the other desires to regulate. During the last few days, the "press organs" of the present majority of the Council have uttered several whimpers that do not show much hope for the result of the election. Thus the "Daily "News," noticing Lord Salisbury's reproach that the present County Council has been too much given to discussing abstract questions, feebly asks why there should be this objection to these useless debates. It is pleaded that people in authority "do not abuse debating societies "for doing the same thing." But a County Council thus put upon the level of a debating society is surely "given "away." Again, we find that egregious print "London" arguing that the community has nothing to fear from the return of a Progressive majority; because "the sobering "influences of a strong opposition has [*sic*] kept the "Progressive program within practical limits." This is somewhat less than half-heartedness. When the best thing an out-and-out partisan can say for his own side is that the other side is too strong for it to do any real harm, he must be already prepared for resting in the cool shades of opposition.

Picketing in Operation.

It is a subject for regret that, so far, no parliamentary notice has been taken of the dastardly outrage perpetrated in the name of Trade Unionism by the strikers of the Cork

and Bandon Railway dispute. The incident is a very lurid illustration of what "picketing" means in practice, when the performers of this legal operation happen to be rough labourers. On Friday, the 18th ult., a small number of soldiers in plain clothes arrived at Cork by the Milford boat, to join the battalion of their regiment stationed there. We give the story of what happened to them from the candid columns of the "Daily News. It runs as follows: "A strike picket that had been told off for "duty (?) on the quay closely observed the passengers as "they left the boat; and, on seeing a party of nine men "leaving in a body, they immediately raised the alarm "that they were blacklegs, and a crowd numbering "about four hundred persons, largely composed of quay "labourers, were as quickly on the spot. No sooner had "the men stepped on to the quay than they were vigorously "hooted, and shouts of 'blackleg' were general." Surprised at this reception, the soldiers exhibited their papers, which should have sufficed to establish their independence of the local or any other labour trouble. But "the "fury of the crowd had been roused to such a pitch that "the protest of the military men went unheeded; and "then ensued a most disgraceful scene. The party were "set upon by the picket, and beaten in a most cowardly "fashion." When the police came, of course the picket had quitted the scene of "duty." Two of the victims were found to have received serious injuries, and the others were all more or less badly beaten. This is picketing in fact and in deed, whatever the operation may be in law. Yet if the police had caught the ruffians and prosecuted them before the Magistrates, the Trade Union would have paid the fines, if any. If the men were to be sent to prison, the Trade Union officials would have remained outside, so as to render them every possible assistance. Thus the law is made a laughing-stock, and law-abiding men are sacrificed to the Trade Union fetish.

The Conditions of the Municipalization of Public Supply Undertakings.

A LETTER signed "Expertus," and dignified with large print—which is usually understood to signify that the writer is a "somebody," whatever the merit of his effusion—expounded to readers of "The Times" of the 22nd ult. the conditions under which gas and water undertakings may be "municipalized" by parliamentary sanction. This communication was called forth by Sir John Lubbock's letters on the modern tendency to place on private enterprise in such matters the onus of showing cause why it should be permitted. We described in an article published last week, the tendency which has marked the development of local self-government in England in regard to these matters; and "Expertus" tells the same story, but in another way. The protection of private enterprise has been the key-note of local self-government legislation. The Public Health Act, 1875, "makes large provision for "the supply of both water and gas by the Local Authority; "but that it should be done by compulsory purchase is not "contemplated by the Act." This remark presupposes the existence of a supply undertaking in private ownership. In the absence, therefore, of general powers of compulsory purchase, and apart from purchase by agreement, the municipalization of an undertaking can be approached by: "(1) A Bill introduced by the Local Authority for "the compulsory purchase of a Company's undertaking "by arbitration, usually under the provisions of the Lands "Clauses Act, 1845. (2) The insertion of a clause for "such compulsory purchase in a Bill of an existing Com"pany having statutory powers, but seeking further "powers from Parliament. (3) The insertion of a "similar clause in the Bill of a limited Company seeking "re-incorporation and statutory powers for their under"taking." The procedure may be by Bill or Provisional Order. Taking these cases *seriatim*, the writer observes with regard to the first that, "with few exceptions, the "practice of Parliament has been to reject the Bill for "the compulsory purchase of the undertaking of an exist"ing Company which has fulfilled the obligations "imposed on it by its Special Act, when the Company "objecting to the expropriation of its property has opposed "the Bill in Committee." The other cases are explained in an equally satisfactory manner; the writer's purpose being to show that Parliament will not often go back upon its action, and disturb a settlement that has worked as it was intended to do—in the interest of the public.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 488.)

STOCKBROKERS have had an anxious time during the past week; for owing to the severe break in American railway securities, heavy differences had to be met at the settlement, and several failures were feared. Although some firms had to be assisted only one actual failure was announced. What with the forced closing of speculative accounts and war rumours, all descriptions receded in the early part of the week. But during the past few days, a much better tone prevailed; and this was, in a measure, assisted by the calmness in which Paris took the statements published in this country respecting West Africa, as well as the conclusion of the Chinese loan with the Hong Kong and Shanghai Bank and the German Asiatic Bank. Consols rose to 113, but eased off a little; Home Rails are stronger, but still inactive; while American rails show a disposition to recover, and Foreign stocks have been supported by the steadiness of the Continental bourses. Very little effect was produced by the firmness of the Money Market and continued heavy borrowings at the Bank of England. Industrial undertakings continue to attract the attention of investors; but Welsbach Incandescent Gas-Light stocks have been less active, and the quotations are easier. Gas stocks were not so much dealt in; the settlement checking business in this department as well as in others. But the most dealing was again in Gaslight "A," which has further declined 3, to 296–300. One or two of the secured stocks have also declined. South Metropolitan is quoted *ex div.*, at 144–147. The feature in the Suburban and Provincial section was the rise in Croydon "B," to 260–270 before the dividend was taken off. The price of the "A" stock also advanced to 317–322. Brentford issues are *ex div.*; but the preference stock maintains its old value. British Gas had a slight relapse. The Continental Companies show dulness. Continental Union, Imperial Continental, Bombay, and Oriental are all easier on the week. As regards Water stocks, East London was flat at one time; but recovered owing to the dividend being raised from 7 to 8 per cent. Grand Junction was also pretty firm; but Lambeth maximum 10 per cent. was weaker.

The daily operations were: On Monday, a fair amount of business was transacted in Gaslight "A;" and a further fall of 1 to 297–302 took place. Imperial Continental was also flat at a fall of 3, to 215–220; while British Gas lost ½ at 56–57; and Bombay Ordinary ¼, at 6¼–6¾. In Water stocks, the only change was a fall of 1 in West Middlesex 4½ per cent. debentures, to 162–165. Tuesday was a very quiet day. A little business was, however, done for the new account in Gaslight "A," Brighton stocks, Imperial Continental, and River Plate; but the only change in values was a rise of 2 in Croydon "A" to 317–322, and "B" 10½ to 260–270. In Water stocks, East London ordinary fell 2½, to 230–235; and Lambeth 10 per cent. 2, to 305–310. On Wednesday, the market was extremely quiet, and very little business was recorded in either Gas or Water stocks—the only change being a fall of 2 in Continental Union Gas, to 247–252. Thursday was another quiet day; but several stocks were quoted *ex div.* Water stocks were likewise unaltered. There was a little more business doing on Friday. Gaslight "A" fell 1½, to 296–300; and ditto "H" 1½, to 200-204. In Water stocks, East London recovered 2, to 232–237. On Saturday, very little business was recorded. But Gaslight 4 per cent. preference fell 1, to 137–140; while in Water stocks, Grand Junction "A" rose 1, to 123–128.

ELECTRIC LIGHTING MEMORANDA.

Charges for Electric Lighting in the City of London—The Charge for "Standing-by"—Dust Destruction and Sewage Sludge Disposal at Leyton and elsewhere.

THE supply of electric lighting in the City of London has hitherto been almost exclusively in the hands of the City of London Electric Lighting Company, whose charge for current was, up to the end of the year, one of the highest in England. The consumers naturally disliked this state of things; and there was some casting about for relief in various directions. An obvious remedy was the favouring of competition. Just outside the City boundary on the west, lay the Charing Cross and Strand Company's mains; and requests were made to this Company to cross the border. This they were willing to do; and their extension into the City would be quite in accordance with the spirit of the Electric Lighting Act, because they supply upon the continuous system, whereas the City of London Company use the alternating system. The Board of Trade have always favoured the idea of the consumers in any district having the facility of choosing between the two systems. Accordingly, as we learn from the speech of the Chairman at the recent general meeting of the Charing Cross and Strand Company, notice has been given of the intention of the Company to apply for a Provisional Order enabling them to supply within the City. This proceeding has had an immediate effect. The Directors of the City of London Company advertise their intention of making a substantial

reduction as well as a radical change in the method of levying their charge for current. There is to be, in short, yet another sliding-scale or differential system of charging for current, by which the consumer who uses his lamps most, or longest, will get his supply at a reduced rate. By the proposed arrangement, for the first 6 units consumed in a quarter, per 8-candle power lamp fixed, the price will be 7d. per unit. For the next 4 units per lamp, the price will be 6d. per unit; for the next 2 units, 5d.; and for the rest, 4d. This schedule is subject to the payment of accounts within fourteen days of their being rendered. Each quarter will be treated separately on its own basis; and when an account is payable monthly or otherwise, instead of quarterly, a corresponding proportionate number of units at the sliding-scale rates will be taken, and the allowance will be made quarterly or monthly as the case may be. Electricity for motive power and heating and cooking purposes exclusively, when supplied through a separate meter, will be charged 3d. per unit where the consumer guarantees to use the supply for not less than 45 hours a week; 4d. per unit otherwise.

The Directors of the City of London Company will doubtless flatter themselves that they have cut the ground from under their possible competitors by offering this new schedule of charges, which they declare has been rendered possible by the financial results of the Company's operations for 1897. But inasmuch as the Charing Cross and Strand Company's price is a level 6d. per unit, with no dodgery about it, there does not seem to be much prospect that the consumers will even now have anything for which to thank the City of London Company. The City is a peculiar district to light, and by far the greater number of the users of electricity for this purpose would be caught in the topmost division of the Company's scale. These people may be pleased with the notion that if only they needed light for a longer time every day, they would get it for less money; but it is rather to be believed that they will prefer the lower uniform charge. The incident shows once more how dissatisfied the electric lighting interest is with the ordinary methods of charging for current. In the City of London, of all places in the kingdom, there ought in fairness to be a trial made of Dr. Hopkinson's principle of making a regular charge per lamp per quarter for "standing-by." For weeks and months banks, offices, and warehouses of all sizes and kinds will never turn on a single lamp; and then in the course of five minutes a local fog will cause them all to light up, if only for half an hour. On the other hand, there is probably no district in England where there is more all-day lighting needed than in the City. Some of the most active places of business are practically shut off from the light of day. Many clerks have to work in cellars, others in nondescript holes and corners with their heads within a foot of the ceiling. To these the electric lamp must be a boon; and they will show their appreciation of it by using it always.

Our contemporary the "Electrical Review" continues in a sceptical attitude with regard to the advantages attributed to the latest-advertised dust destruction and electricity-generating combination—the one at Leyton. It had been claimed for the Leyton plant that it was the first in which sewage sludge was burnt along with the town refuse. Somebody told Sir Douglas Galton a fairy tale about this; and he repeated it as a testimony to the excellence of the Leyton arrangement. Naturally, this piece of pretence aroused the wrath of Mr. Charles Jones, of Ealing, who has been doing for the past fifteen years what is thus credited to Leyton as a discovery. The Leyton people have now informed our contemporary that the difference between their practice and that in force at Ealing is that theirs is pressed sludge, whereas Mr. Jones's sludge is burnt unpressed. The obvious rejoinder to this statement is, Why press the sludge? Pressing costs money, and does not improve the material for disposal by cremation. Our contemporary justly remarks that the most important element in the destructor question is the cost of labour per ton of refuse burnt, having regard to the wages paid and the number of hours worked by the men. It appears that this cost works out in the case of Leyton to 1s. 7d. per ton; while at Ealing it is 1s. 1½d. per ton, exclusive of returns from the sale of clinker, &c. Speaking at Leyton, in praise of the destructor system of disposing of sewage sludge, Sir Douglas Galton is reported to have said that the local solution of this problem of sanitation was superior in point of economy to the Metropolitan practice of barging the stuff to deep water outside the Port of London. It is as well to have these matters straightened out as one goes along. In point of fact, the cost of removing the Metropolitan sewage sludge to sea—and 2,178,000 tons of the hopeless stuff, containing 91·40 per cent. of moisture, were so disposed of in 1896—works out to 4·59d. per ton, everything included. This is far and away the cheapest way of disposing of the most offensive product of modern civilization that can be found in operation anywhere. Of course, it does not "utilize" the stuff—blessed word in the mouths of those who are never content unless they can "see the wheels go round!" Here is a splendid opening for the confirmed "utilizer," who will perhaps ask why all this enormous weight of matter, which is a "fuel" inasmuch as it can be and is burnt in various places, is not made to light London by electricity, or converted into gas, or done something with instead of being thrown away. Well, the best answer to this kind of question is that it is one of the highest exercises of economical science to know what to throw away, and when, and where. The great organism known as a modern town community has its collective digestive processes, from which results a form of matter that is truly dirt and rubbish in the fullest sense of these terms. This stuff can be riddled and picked over and washed down; but at the last there will remain something for which mankind has no further use. The only thing to be done with it then is to return it, at as small an expense as possible, to the larger store-houses of Nature in earth, or sea, or sky, where in course of time it will be made over afresh.

WORKMEN'S COMPENSATION.

An instructive paper on Workmen's Compensation was recently read before the Society of Arts by Mr. A. D. Provand, M.P. The author is a merchant and director of public companies, who has identified himself of late years, both in and out of Parliament, with the advocacy of a certain order of Labour politics. He keeps a philanthropic eye upon the practical aspects of the cause of Labour, and desires the improvement of the condition of the wage-earning and small-salaried sections of the population in a variety of tangible respects. Thus his paper upon compensation to workmen was designed to elucidate the question of how the workman is to get most good out of the new conditions of employment created by the Act of last session, not overlooking the case of the employer.

Mr. Provand began his recent Society of Arts paper by giving a brief history of the law regulating employers' liability in the past; but in this labour we shall not follow him, for the reason that this part of the subject was dealt with in the last volume of the Journal (pp. 1164, 1227), following Mr. A. Birrell, Q.C., who is probably a far safer leader through the legal maze than Mr. Provand. We desire to make this essay a continuation of those articles; for, as will be remembered, Mr. Birrell left off just where the legislation of last year began. At the present time, and until the 1st of July next, the particular law of workmen's compensation is and will be the law of the Employers' Liability Act of 1880—in addition, of course, to the common law, which no statutes supersede. From 1880 down to 1894 there was a constant succession of Bills in Parliament for dealing with the question. Every one of these abortive measures, including the Bill of Mr. Asquith in the last-named year, was an embodiment of Trade Union desires. Mr. Provand says, using the customary euphemism, that they "sought to carry out to a large extent the views of the workmen's representatives;" and he bluntly declares that the principal feature in all these Bills, more especially the last one, was that "they provided ample opportunities for a workman to go to law." There could not be a severer criticism of the Trade Union inspired proposals of the late Government. Mr. Provand leaves no room for doubt as to his opinions of the quality of these proposals. "Making the compensation unlimited, extending the limits of time for giving notice in some cases, imposing no limit of time at all in others, and similar changes, merely created facilities to be taken advantage of by lawyers. . . . There is nothing to me so remarkable as that workmen should believe they are likely to obtain advantages under any system whatever which admits of their easily going to law. . . . But it is remarkable that their leaders should, with something like unanimity, have advocated an Employers' Liability Bill of a character which could never have led to anything whatever except more lawsuits than had already taken place under the Act of 1880, with consequences more injurious to employers and more disastrous to the interests of workmen." Let us pause here to deal with the incidental questions raised in this passage.

Doubtless, Mr. Provand's indictment of the proposals of the Bill of 1894 is just. But a little consideration will show that there is nothing "remarkable," as he observes, about the acceptance of the Bill by workmen's "leaders"—meaning the Trade Union officials. It was their Bill; and, if passed, it would have delivered the working classes of this country into their hands. The workmen themselves had no voice in the matter. The Government of the day made the cardinal mistake of taking the voice of the Trade Union leaders as that of the working-class population. They learnt their error at the following General Election. The chief difference between the Administration that produced the existing Compensation Act and its predecessor is that it was able to distinguish between the interests of the working man and those of his professional "leaders," which the previous Government did not do.

Mr. Provand is not so clear upon this point as could be wished. He seems more than half disposed to concede to Trade Union officials the character of representatives of the working classes, whose opinion of a Workmen's Compensation Bill is entitled to respect. This is not so. These men represent themselves and their own peculiar interests, first and last. It is their business, of course, to make politicians and the public believe that they are able to say with authority what the working man wants, and that besides themselves nobody has any right to a voice in such matters. But it would be an evil day for this country if such a pretence were ever to be allowed. Parliament is responsible for making just laws for all sorts and conditions of the people; and the only proper origin and sanction of class legislation is that general sense of what is right and expedient which has inspired our lawgivers as a whole, and has never been consciously bent to the dictates of a self-seeking coterie.

Mr. Provand perhaps does not care to speak so plainly of the character of official Trade Union politics; but nevertheless he argues against the view taken of employers' liability by the Trade Union representatives. He credits them with fostering the opinion among workmen—at least, this is what we understand him to advance—"that employers could be made liable for a very large proportion of accidents, and that large sums could be recovered by going into Court." Furthermore, he asserts that they held the "supplementary opinion, to the effect that an Employers' Liability Bill should be a Bill to prevent accidents." The former belief is erroneous, as cited statistics prove. Of all industrial accidents registered and dealt with under various workmen's accident funds, including that of the South Metropolitan Gas Company (under the old system), for only a very small minority could the employer have been made legally responsible. Thus the first Trade Union contention fails. Upon the second, evidence is adduced to show that the supposition that workmen can "recover large amounts through the Courts" is unfounded. In spite of the notorious tenderness of juries to workmen plaintiffs suing employer defendants, in England only 26·69 per cent. of the claims preferred under the Act of 1880 have been recovered. In Ireland the proportion was 17·30 per cent.; and in Scotland only 3·74 per cent. These figures may be susceptible of various interpretations; but the conclusion drawn from them by Mr. Provand is that it is a delusion to suppose "that any large sums could be recovered in actions against employers." Respecting the third, or "supplementary" opinion, that an Employers' Liability Bill should be a Bill to prevent accidents, Mr. Provand argues that this is impossible. The prevention of accidents can only be adequately provided for by Bills passed expressly for the purpose. The two objects cannot be compassed by one and the same piece of legislation.

Having thus disposed of the only alternative proposals that have come within the field of practical politics, Mr. Provand considers the Workmen's Compensation Act of last session upon its merits. He regards it as incomplete and under certain limitations; but "nevertheless a movement in the right direction." Even so, it is likely to have an effect reaching farther than is generally expected. [Corroboration of this opinion is to be found in the statements in point made by the Chairmen of the South Metropolitan Gas and London and North-Western Railway Companies at the recent general meetings.] Mr. Provand first of all considers the objections to the Act expressed by "workmen's representatives"—again meaning Trade Union officials. "Many of them have expressed the opinion that if the insurance of compensation risks is permitted, it will make the employers careless." This is a good example of the fine old crusted *à priori* argument, which has wrought so much mischief in the world, and done very little good to any cause that has employed it. Mr. Provand disposes of it in this connection very easily. Insurance does not, as a matter of fact, work in this way. "Experience proves that in every department where insurance is practicable it increases instead of weakening the responsibility of the person who insures." Houses, ships, and other property, can be insured against destruction by fire and storm; but this consideration has not tended to encourage bad building, either of houses or ships. Neither the house owner nor the ship owner has any voice in the matter. The underwriters soon get to know what are the avoidable shortcomings of construction; and they insist upon observance of their rules in this regard, or they will not take the risk. So it will be with the insurance of workmen's compensation. It is to the interest of workmen that their compensation should be certain. "To have this insured will create another interest that will protect it—that is to say, those who take the risk will see that the conditions under which the risk was taken are maintained." Thus another Trade Union fallacy crumbles under the touch of a critic familiar with ordinary business considerations.

Indeed, this is one more added to the number of instances that are daily accumulating to show that the official Trade Union view of any question affecting the interests of Labour is sure to be the wrong one. As Mr. Provand remarks: "It is difficult to account for the objection of workmen to insurance, as it is indisputable that unless the compensation is insured, they will in many cases be unable to obtain it." Here, again, it is not the workman who objects to insurance; but his paid leader, the official "blind leader of the blind." The small employer, "whom an accident involving the life of a single man would make bankrupt," and the coalowner or mining company liable to be called upon to provide at a blow compensation for a pitful of men, must alike have recourse to insurance if workmen's compensation is to be a reality.

Having thus arrived at the conclusion that insurance of compensation risks must in some way be effected, Mr. Provand considers how this may be done. He does not think that much of the new class of business created by the Workmen's Compensation Act is likely to go to the regular accident insurance offices. The big employers will, in a general way, adopt mutual arrangements. Mr. Livesey made some remarks upon the working of the South Metropolitan scheme of the kind up to the present time; but in this regard the ordinary rule of insurance companies should be followed, and results taken only over an average of five years. Mr. Provand passes in review the probable operation of the Act upon various industries; and he inclines to the opinion that, having regard to old sick and accident funds and the limitations of the new Act, employers and employed will come to terms, "and mutually contribute on an agreed scale" to meet all liabilities out of a common fund. The Act offers strong inducement to the formation of such mutual arrangements. By not offering any compensation for the first fortnight, and by denying compensation to sufferers by their own default, the Act leaves a door wide open for independent bargains in which these limitations do not appear. With regard to the cost of all industrial accidents, in every trade, Mr. Provand's calculation is that it could be met by a charge of one-half per cent. of the total wages paid. [Mr. Livesey puts it at 1d. per week per man engaged in the gas industry.] For the coal-mining industry, Mr. Provand take the charge at ½d. per ton of coal raised. He establishes the fact that there is a great difference between workshops and factories, in regard to the risks of employment. Whereas in workshops, where there is no steam power and very little machinery, one person is killed out of 183,000 workers, in factories the proportion rises to 1 in 16,000. There is no corresponding compensation in the rates of wages paid; and it is quite a fallacy to suppose, as some economists have taught, that the risk of a calling is paid for in the wages. This consideration does not affect the rate of wages; some of the most dangerous occupations being the worst paid.

PERSONAL.

Mr. H. Saunders French has been appointed Secretary of the Trowbridge Water Company, in succession to Mr. W. Peed, who has absconded.

The will of Mr. G. Gripper, who was Chairman of the Tottenham and Edmonton Gas Company from 1887 till his death on July 11 last year, has been proved by his three sons, by whom the personalty is sworn at £60,313.

On learning that Mr. Matt. Dunn had secured the position of Manager of the Goole Gas and Water Works, as already announced in the "Journal," the Selby Urban District Council sought to retain his services by an offer of an increase of £100 per annum in his salary at once, and a further £50 spread over two years. The proposition was, with a single exception, a unanimous one. But, after giving the matter due consideration, Mr. Dunn has decided to accept the Goole appointment.

OBITUARY.

We regret to record the death, on Monday last week, in his 53rd year, of Alderman G. H. Grimwood, the eldest brother of Mr. C. W. Grimwood, the Lessee of the Sudbury (Suffolk) Gas-Works. Deceased had been a Director of the Sudbury Gas and Coke Company since 1881; and those of our readers who were present at the meeting of the Eastern Counties Gas Managers' Association in that town three years ago, on the occasion of his brother's presidency, will probably remember that he took the chair at the luncheon in the Town Hall. He came of an old Sudbury family, and was senior partner in the firm of Messrs. Grimwood and Sons, contractors and builders. He was elected a Town Councillor in 1881, and an Alderman in 1895; and he filled the office of Mayor from 1891 to 1893—a position now held by his brother Arthur, who was re-elected last November. He was a Justice of the Peace and a prominent Freemason. He died at Brighton, where he had been residing with his wife and daughter for the benefit of his health.

The Meeting of The Gas Institute.—We are asked by the Secretary of the Incorporated Gas Institute (Mr. Walter T. Dunn) to intimate that the Council have fixed Tuesday, the 14th of June, as the date of the commencement of the proceedings of the ensuing annual general meeting, to be held in Belfast, under the presidency of Mr. James Stelfox, M.Inst.C.E., the Engineer and Manager of the Corporation Gas-Works there.

The Measurement of High Temperatures.—The subject of the measurement of high temperatures by the interference method was recently dealt with by M. Daniel Berthelot at the Paris Academy of Sciences. The method is based upon the fact that if the density of a gas is diminished to the same extent, on the one hand by a rise of temperature, or on the other by a diminution of pressure, the index of refraction has the same value in both cases. The constant temperature required in these experiments was obtained by means of an electric furnace, composed of two spirals of platinum wire, jacketed with asbestos, by which any temperature up to 1000° C. could be steadily maintained.

The Metropolitan Water Supply Commission.—As briefly recorded last Tuesday, the twelfth sitting of the Commission took place the previous day—Lord Llandaff presiding—when Mr. G. L. Gomme, the Statistical Officer of the London County Council, who had been under examination for two days, was cross-examined by Mr. Littler and Mr. Pember. The inquiry was then adjourned till yesterday, when Mr. Willoughby H. Dickinson, the Chairman of the Water Committee of the Council, was called, and, in reply to the Chairman, sketched in detail the various steps taken by the Council since their establishment in 1889, with reference to the water supply of the Metropolis and the purchase of the undertakings of the Companies. Our report of the proceedings of the Commission will be continued next week.

NOTES.

The Dissociation of Calcium Carbide.

The researches of M. Henri Moissan on the conditions of formation of alkaline and other carbides referred to in the "JOURNAL" for Feb. 15 (p. 339) had a most important bearing on the manufacture of calcium carbide. He found that the very powerful electric current of 1200 ampères and 60 volts decomposed a small quantity of calcium carbide in less than ten minutes from the time of its formation. Graphite and calcium were the products of the decomposition, and the latter volatilized, so that only a mass of graphite remained. It was shown that calcium carbide could not be volatilized without dissociation taking place. It thus appears that there is a limit to the strength of the current which may be employed in the manufacture of this material, and that the carbide should be removed from the sphere of action soon after formation. The dissociation of calcium carbide by heat is precisely analogous to the dissociation of the carbides of potassium, sodium, and magnesium; but a temperature higher than that of the ordinary electric furnace is necessary to effect it. Lithium carbide occupies an intermediate position; being formed in the furnace, but dissociated far more easily than the calcium compound.

The Haskin Timber-Preserving Process.

At a time when the condition of the market for tar products is a topic of serious interest for gas manufacturers, it is not altogether cheering to read of the experimental success of the Haskin process for dispensing with creosote in the preservation of wood. It is reported that extensive works for carrying out the new process have been laid down on the site of the old Samuda shipbuilding yard, in the Isle of Dogs. The process, to which reference was made in a "Note" in the "JOURNAL" for April 30, 1895, is declared to be a very much cleaner one than that of creosoting timber. It consists essentially in semi-carbonizing the timber in bulk, which is effected by enclosing it in a heating chamber, where it is subjected to the action of hot air under a pressure of 200 lbs. per square inch. Messrs. Galloway have constructed large chambers which are perfectly tight under this pressure of air at temperatures ranging from 300° to 400° Fahr. The air has to be dry in order to produce the desired effect, which can only be described as equivalent to the creosoting process, inasmuch as the antiseptic is actually formed within the structure of the timber. Simple as the principle is, it is manifestly one that involves the use of powerful machinery and expensive plant, which has been described and illustrated in the "Engineer." Colonel Haskin, the inventor of the new process, seems to have been led to experimenting in this direction by the comparative scarcity of coal tar creosote in the United States, which necessitated the use for the preservation of timber of the analogous product of carbonized wood. The success of his process depends wholly upon the equable distribution of heat throughout the mass of the wood, up to the critical temperature at which the nature of the perishable sap and fibre undergo alteration without losing strength as timber. It is claimed that this result can be attained in regular working on the large scale.

The Latest Practice in Steel Water-Mains.

The water supply of the mining region of Coolgardie, West Australia, being of cardinal importance, the opinion of a Committee of English experts was obtained upon the main features of the project, including the proposed piping. The Committee reported in favour of mains of mild steel, having a tensile strength of from 25 to 28 tons per square inch, with at least 16 per cent. elongation in 8 inches. The method of making the longitudinal joints—whether these are gas-welded, riveted, or dovetailed—is considered at length in the report, but is not finally pronounced upon. Mr. Mephan Ferguson has patented a steel pipe with a dovetailed longitudinal joint, which is termed a "rivetless seam." The joint is made by swelling the longitudinal edges of the plate, and bringing them together in grooves made in the opposite sides of a long bar. This bar is then closed by pressure upon the swollen edges of the plate. The pipe as manufactured has been tested by Professor Unwin at the Messrs. Gwynne's works, with satisfactory results. The Committee are of opinion that if pipes with such joints can be manufactured on a large scale with similar results to those so far obtained on a small one, they would be particularly well suited for use in the Coolgardie aqueduct. They would probably be cheaper than riveted pipes, there would be fewer points of possible leakage, and they would have less hydraulic resistance. Spiral riveted pipes have been suggested; but they are rejected as offering insufficient advantages. The Committee declare that pipes with gas-welded longitudinal joints are undoubtedly the best. They are stronger for a given thickness than riveted pipes; and, having a smooth surface, they present less interruption to the free flow of water. But the immunity from possible leakage at the joints is a still more important advantage. Per unit of length, they are somewhat more expensive than riveted pipes; but being about 30 per cent. stronger for equal diameter and thickness, it is actually cheaper to employ them wherever the necessary thickness of the riveted pipe is at least ¼ inch, below which welded pipes become difficult to manufacture of the required diameter. The Committee therefore recommend that those pipes which will be subject to the heavier pressures, and which therefore require a thickness of ¼ inch or more, should be made with two gas-welded longitudinal joints, and formed in tubes of about 14 feet length, coupled into pipes of about 28 feet long, by inserting a plain end of one tube into a socket formed on the other—the transverse joint being riveted. The chief part of the pipe-line will be made of riveted mains, of 3-16th inch plates as long as can be procured. Every alternate length will be of larger and smaller diameter; the difference being twice the plate thickness. Thus the end of one length will slip over the end of the next, and be single riveted *in situ*. The mains are to be protected by being dipped in an asphaltic composition compounded of natural asphalte with so much creosote added as may be necessary to produce when cold a smooth, plastic, and strongly adhesive varnish.

Main Laying under Water.

A description of two jobs of subaqueous main laying executed in America during the past year has appeared in the "Engineering Record." The first was a 16-inch water-main laid across the Cedar River where the stream was 600 feet wide and 2½ feet deep, with a rapid current. The trench was first excavated to an average depth of 2 feet below the river bed, which was gravel and loose rock. This took forty men three days. Trestles were then set up across the trench at 12 feet centres, and levelled. A floating platform was placed between the legs of the trestles, 16 feet long, bearing against a greased guide plank on the down-stream side. The lengths of main were put together on this float, and then hung up to the trestles by means of 1¼-inch lowering screws. The bottom ends of these screws were connected by means of pins to eyed bands placed upon the pipe. Just before lowering, wires were attached to the pins, by means of which they could be pulled out when the pipe was in place. The straps were left on. The main was of cast iron, with socket and spigot joints made with yarn and lead. It was found necessary to fill the pipe with water to make it sink. The job of laying occupied two weeks, and cost for everything necessary, except the pipe delivered, $1·25 per foot run. The second job of the kind was at Nashua, New Haven, on the system of the Pennychuck Water Company. The river at the point of crossing is 250 feet wide and 18 feet deep. The main was 24 inches in diameter, the submerged lengths being made 1 inch thick, with Ward joints. It was put together on rollers on one side of the river, and then hauled ahead by a windlass on the opposite bank. The end of the first section was plugged, and eight empty oil-barrels were lashed to each length to help float it. When the main had been pulled across, it was filled with water and the casks cut loose. Afterwards it was filled with air at 60 lbs. pressure, and all places where bubbles were seen to escape were caulked by a diver.

British Association of Water-Works Engineers.—We have just received the second volume of "Transactions" of this Association, containing the report of the proceedings at the annual meeting held in London last July, under the presidency of Mr. H. Ashton Hill, M.Inst.C.E., the Engineer of the South Staffordshire Water Company, whose portrait forms a frontispiece. The text is illustrated by diagrams and folding plates. The volume has been produced under the editorship of the Secretary, Mr. W. H. Brothers.

The Workmen's Compensation Act, 1897.—In the "JOURNAL" last week we noticed the issue of the third edition of Mr. Willis's annotations to the above-named Act. We have since received another very useful handbook to the Act, prepared by Mr. M. Roberts-Jones, of Cardiff, Barrister-at-Law, of Gray's Inn and the South Wales Circuit. The author is specially well qualified to deal with the subject of workmen's compensation, inasmuch as he is the Coroner for South Monmouthshire, and a member of the Board of Management of the Monmouthshire and South Wales Miners' Provident Society. The worth of his book may be judged by the fact that it has already reached its fifth edition, in which the matter has been revised and extended, and presented in a convenient form for reference. There is a list of statutes referred to, a table of cases cited, and an index. The book is published at the office of the "Western Mail," Cardiff, and at 82, Fleet Street, E.C.

The Engineer's Year-Book for 1898.—We have received from the publishers (Messrs. Crosby Lockwood and Son), a copy of the fifth year's issue of this indispensable daily reference-book for engineers. It is a truly remarkable collection of engineering formulæ, rules, tables, data, and memoranda, by Mr. H. R. Kempe, Assoc.M.Inst.C.E.; and it represents an enormous amount of patient labour. The book has been thoroughly revised, and new matter added; bringing up the number of pages to 700, as compared with 590 in the first issue. The work is a development on the lines of Molesworth, Trautwine, and D. Kinnear Clark; and, taking into account the high order of the contents, and the wide range of subjects included, it commends itself to all engineers as a distinct advance on anything of a similar kind. The difficult task of concisely and clearly arranging the letterpress and illustrations, of which there are 850, has been well executed; and the print, though necessarily small, is clear. The interposition of pages of advertisements in the text is, in our view, a blemish; but this, of course, is no detriment to the value of the matter. The book is bound in scarlet leather, and gilt edged and lettered.

TECHNICAL RECORD.

INCORPORATED INSTITUTION OF GAS ENGINEERS.

The Annual General Meeting of this Institution was commenced last Saturday, at the Offices, No. 11, Victoria Street, Westminster. In the absence of the President (Mr. Corbet Woodall), Mr. C. C. CARPENTER occupied the chair.

CONFIRMATION OF MINUTES.

The SECRETARY (Mr. T. Cole) read the notice convening the meeting and also the minutes of the meetings held last year; and the latter were confirmed.

ELECTION OF OFFICERS AND MEMBERS.

The balloting-lists for the election of officers and members were next examined by the SCRUTINEER (Mr. T. S. Lacey), who reported that the following gentlemen had been appointed to office:—

President—Mr. George E. Stevenson, of Manchester.

Vice-President—Mr. T. Banbury Ball, of Rochdale.

*New Members of Council**—Mr. Walter Ralph Herring, of Edinburgh; Mr. Frank Livesey, of London; Mr. Frederick D. Marshall, of Copenhagen; and Mr. Joseph Tysoe, of East Greenwich.

Auditors—Mr. Magnus Ohren, of Sydenham; and Mr. Alfred Lass, of London.

* The other Members of Council are: Mr. C. E. Botley, of Hastings; Mr. W. W. Fiddes, of Bristol; Mr. T. May, of Richmond; Mr. A. C. M'Minn, of Kensal Green; and Mr. F. W. Stevenson, of Sheffield.

Mr. Lacey also announced that the following gentlemen had been admitted to membership:—

Mr. H. T. Armitt, of Santiago; Mr. R. Brown, of Cambridge; Mr. J. W. Buckley, of Falmouth; Mr. J. R. Heath, of Etruria; Mr. S. Simmelkjör, of London; Mr. J. M. Thomas, of Penryn, Cornwall.

On the proposition of Mr. T. MAY (Richmond), seconded by Mr. J. W. HELPS (Croydon), the report of the Scrutineer was adopted.

The CHAIRMAN then declared the meeting adjourned to Tuesday, June 14, and the following day.

It will be noticed that the meeting is to be held about six weeks later than usual; and we are officially informed that this postponement is unavoidable owing to the proposed visit of the Dutch Association of Gas Engineers to London as the guests of the Institution—being a kind of reciprocation of the courtesy shown the members of the Institution by their Dutch *confrères* on the occasion of their visit to Amsterdam last year. The place of meeting has not been definitely arranged, but it will be in London; the Dutch Association having expressly desired that their visit shall be confined entirely to the Metropolis. The visitors will be invited to take part in the usual excursion on the third day of the meeting; and Friday the Council have decided to devote to paying additional visits to some of the principal London Gas-Works, of which Beckton and East Greenwich are to receive the greatest share of attention.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Annual General Meeting of this Association was held on Thursday, at the Grand Hotel, Birmingham—the PRESIDENT (Mr. J. T. Lewis, of Wellingborough) in the chair. There was a very fair muster of members.

The HON. SECRETARY (Mr. C. Meiklejohn, of Rugby) commenced the proceedings by reading the minutes of the meeting held on Oct. 28 last; and they were confirmed.

ANNUAL REPORT AND ACCOUNTS.

The annual report and accounts were then presented. The former was mainly devoted to a review of the proceedings at the three meetings held during the year 1897, which were all eminently successful and profitable. It also stated that four new members had joined the Association, one had ceased to be a member under the operation of one of the rules, and five members had resigned. The Committee concluded by pleading for "a more active sympathy in the work of the Association by the members generally." The accounts showed that, with the balance brought from 1896 (£89 11s. 9d.), the receipts amounted to £134 12s. 6d.; and deducting the expenditure, the sum of £87 14s. 4d. remained to be carried forward. The outstanding subscriptions, it was mentioned, amounted to £6 16s.

Mr. W. BELTON (Shrewsbury), in moving the adoption of the report and accounts, said the former reviewed the very useful year they had had under the genial presidency of Mr. John Young. As to the accounts, it was satisfactory to notice that there was no material difference in the balance at the end of the year. It was under £2; and this would not have been so had it not been for the unfortunate item "outstanding subscriptions, £6 16s." This was a condition of things that ought not to exist in an Association like theirs, where the subscription was so small, and the advantages obtained so large. It was the earnest hope of the President and the Committee that, by the end of the current year, they would see this blot had disappeared from the balance-sheet.

Mr. J. S. CRANMER (Stratford-on-Avon) seconded the motion, which was unanimously carried.

ADDITIONS TO THE ROLL.

On the motion of Mr. W. NORTH (Stourbridge), seconded by Mr. J. S. REEVES (Bilston), the following gentlemen were admitted to membership of the Association: Mr. J. R. Heath, of Etruria, Stoke-on-Trent; Mr. F. J. Ward, of Knowle; Mr. W. G. S. Cranmer, of Willenhall; Mr. A. Gould, of Bewdley; and Mr. F. W. Torpey, of the Whitwick and Coalville Gas-Works.

The PRESIDENT then proceeded to read his

INAUGURAL ADDRESS.

Gentlemen,—To-day, in occupying the position as your President, my first duty is to most heartily thank you for the honour conferred upon me in electing me to this high position. During the course of one's career, the hope that some time we may be found worthy of occupying the position of President, animates most of us; and if such has been my ambition, the fulfilment is certainly in advance of my desires. If I should fail in thoroughly grasping aright the responsibilities attached to the office of President of an Association having, like this one, a distinguished record of the past to look upon, I must ask you to accord me that kind indulgence and support which I know has been so readily given in the past to my predecessors. So far as lies in my power, no effort shall be wanting on my part to maintain the high status of the Association, and if possible to increase its sphere of usefulness.

The past year has been a memorable one in the annals of our country; for we have celebrated, under the happiest conditions, the record reign of a record Sovereign. May our beloved Queen, and we her loyal subjects, be spared to participate in the seventieth anniversary of her most beneficent rule over this the greatest Empire of the world.

The winter we are passing through is one of extraordinary mildness; such spring-like weather is only remembered by the oldest inhabitant. Our labours have been thereby lightened, but at the expense of a reduced output. Fortunate are those who can report an increased consumption in spite of these conditions.

The past year has, on the whole, been chiefly remarkable for steady growth and prosperity. No startling innovations have taken place in any of our processes. There has been, however, marked evidence in all directions of efforts made to bring plant up to date. Happily, with few exceptions, our works have been free from labour troubles of a serious character; but unfortunately for the welfare of our country, such has not been the experience in other industries. The stupendous struggle at one time threatened by the Railway Men's Union, was only averted by the firm and determined position taken up by the railway companies concerned, who insisted upon the right of dealing with their own men in their own way. In this contention, they were wisely backed up by the President of the Board of Trade. The fearful struggle commenced by the Engineers' Union is now, I rejoice to say, a thing of the past; but though the fight is over, its evil effects are widespread, and will, I fear, be lasting.

We, as responsible heads of large labour employers, are deeply interested in these matters; and we owe a great debt of gratitude to the Employers' Federation for so bravely and determinedly fighting the battle of liberty against the tyranny of New Unionism. As patriotic Englishmen, we claim of all nations the greatest freedom. It is our boast that we have perfect liberty of action in all things consistent with the welfare of the people and the State; and yet it is impossible to conceive a more intolerable form of slavery than that to which so many of our fellow countrymen seem willing to submit, in carrying out the dictates of their various Unions—for it cannot be pretended that the members of a rampant Unionism have that freedom of action which we feel that every individual ought not only to possess, but to exercise. It is a well-known fact that individual members of a Union, however much they may dislike or disapprove of their leaders' action, dare not, except in rare cases, oppose the carrying out of their behests. Not content with securing the bondage of the men, the Unions have for a considerable time exercised in various degrees their power to prevent the employers from obtaining from their men and machinery such returns as they had a right to expect. This spirit of interference on the part of the men's Union representatives had become so unbearable that the employers were driven to assert their right to freedom of management in their own workshops. This intolerable interference with the rights and privileges of the employers has been broken by their Federation, let us hope for ever; and now that this has been done, and the employers have shown their power to protect and preserve their rights, let them take care the power called into existence for defence is not used at any time for offence, but see it is used on the side of true freedom and righteousness.

To maintain true industrial peace, there must be perfect freedom on the part of the employee, as well as on the part of the employer. We all recognize that both have their rights, privileges, and responsibilities. Both have capital to invest, which only differs in kind and quantity; and both are entitled to an adequate return upon their investment. How to secure the right proportion to both parties without strife, is the difficult problem to be solved. It is no new question that has arisen during the last few years; for, in some form or other, the history of our

industrial life is full of differences between employed and employer.

Is there a true solution for these difficulties at hand? Is profit-sharing, or making our employees shareholders in our respective concerns, the solution? I think it is, and that in the end this will be generally acknowledged and acted upon. I fully admit that the difficulties of applying the principle in practice are great, and that it is only where there is an earnest desire to make profit-sharing a success that it will succeed. It is not a thing to be taken up as a fad, or temporary sop in case of emergency. This idea of profit-sharing is to many minds considered unfair, because profit only is shared; and it is said truly that the losses ought to be shared also, if the idea of partnership is properly carried out. But is not profit-sharing, in the shape we know it, more an addition to wages in the form of a lump sum for good service rendered, than perhaps an actual share of profits? As soon as these payments begin, the door is opened for the employees to invest their money in the concern, and ultimately to become true shareholders. With gas companies it is comparatively easy to carry out a scheme of profit-sharing; but with corporations and other local authorities, the case is very different. It is to the lasting honour of Mr. George Livesey that he, at great cost, stuck to his scheme of profit-sharing; and he has shown that, in the case of the South Metropolitan Gas Company, it is an unqualified success. Surely a scheme which has restored good feeling between employed and employers, and that has enabled the employees to become shareholders in the Company by investing the magnificent sum of £100,000 in the capital of it, is one at least worthy of our fullest consideration, and, if circumstances permit, of our imitation.

Putting aside the difficulties of the labour question, we have to face competition from various sources for the supply of light. It matters not from what source the competition comes, it is real, and should stimulate each of us to adopt every means within our power to overcome it. We must not delude ourselves with the idea of fancied security, because to-day we are able to maintain supremacy over our competitors. No; whatever the future may bring, it is clearly our duty to see that our plant is the most efficient possible to manufacture gas cheaply, and of the highest quality consistent with the price to be paid for it.

For a few moments, let us consider the changes that have already taken place in our working results during the past twenty years—results rendered possible not so much by changes in plant and methods, as by improvements and knowledge in the working of the plant placed at our disposal. When the standard work of the gas profession, "King's Treatise on Coal Gas," was published, no furnaces of the generator or regenerative type were in use in this country; they had been tried, but given up. In some few instances, they were in use on the Continent, giving promise of the results since obtained. The fuel account was high; the sales of coke not averaging more than 8 cwt. per ton of coal, instead of 10 cwt. to-day. The make of gas per mouthpiece was from 5000 to 6000 cubic feet; while to-day the average would be between 7000 and 10,000 cubic feet. The yield of gas per ton of coal did not then average more than 10,000 cubic feet; now we are not satisfied with less than 11,000 cubic feet. The actual difference is rather greater than stated; for the reason that at the present time coal contracts are based on a ton of 2240 lbs., while during the earlier period they were almost universally made on 2352 lbs.; and in the case of seaborne coal, this weight was exceeded.

Stoking machinery was at that time little known; and machinery in gas-works, beyond the exhauster and pumps, was conspicuous by its absence. Nearly all the work was performed by hand; and certainly it was more arduous, as far as the retort-house portion was concerned, owing to the generally cramped area of the old houses compared with the roomy and well-ventilated ones of the present day. Wages during this period have enormously increased; and yet, owing to the great difference in the working results, and economies effected in distribution, the price of gas is very considerably lower, while I believe that generally speaking the illuminating power and purity are to-day higher than before. If such results have been achieved during the past twenty years, who is prepared to say that the acme of perfection is reached? Certainly I do not think that we have as yet obtained the highest results possible by the carbonization of coal. I look forward to the time when our working results will agree very closely with the best analysis of the coal.

At present I do not think we fully understand the effects of temperature and time-contact in determining the yield of gas and illuminating value upon the coal carbonized. We know that increased heat gives increased yield of gas of a lower illuminating value, but with greater yield of illuminating matter. For instance, a coal yielding 10,821 cubic feet of 16·7-candle gas, equal to 36,140 candles per ton, will at a higher temperature yield 12,006 cubic feet of 15·6-candle gas, equal to 37,460 candles per ton—an increase of 1320 candles. In ordinary working with mixed coals of different qualities, I find that our results average about 11,000 cubic feet of 16·5 candles, or 36,300 candles per ton of coal carbonized. But I have on several occasions obtained from the same coals much higher results when making working tests—as, for instance, 12,256 cubic feet of 16-candle gas, equal to 38,923 candles, and 12,396 cubic feet of 15·75-candle gas, equal to 39,219 candles per ton of coal carbonized, or an average of 39,071 candles, which gives an increase of 2771 candles per ton of coal. The very interesting experiment on the instantaneous production of gas from coal, referred to by Mr. W. Foulis in his Presidential Address to the Institution of Gas Engineers, in May, 1896, is worthy of attention and further experiment; for though the experiments might prove the impracticability of the method for ordinary purposes of carbonization, I think a good deal of useful information would be obtained on this all-important subject.

Stopped ascension-pipes have an important bearing upon the production of gas. Where this trouble is of frequent occurrence, the loss of gas must be considerable. Many are the so-called cures that have been tried to prevent this difficulty; but the trouble still remains. We heard very little about the subject previous to the custom of carbonizing at high temperatures. Like others, I have had my share of these troubles—in fact, at one time it was almost painful to go into the retort-house and see the men at the trying work of clearing out the ascension and bridge pipes. The difficulty always increased when the heats were higher than usual; and then it took a long time to get straight again. I found invariably that the hydraulic main had much to answer for in connection with this matter owing to the dip-pipes being sealed, not in liquor, but in a very soft pitch, so that the gas was prevented from freely getting away. I could not dispense with all the hydraulic mains, so I had to try and remedy the difficulty; and, as far as an extension of the retort-bench is concerned, I have certainly succeeded, if not in curing it, at any rate in reducing it to a minimum. I altered the shape of the main from ⊃ shape to quadrant shape, which considerably facilitated the removal of the tar. In both mains, the gas, tar, and liquor outlets are separate; but special care was taken to see that the tar and liquor outlet arrangements really worked with the new main, as considerable difficulty had been experienced to get the overflow arrangements to always do their duty on the old sections of main. For the last four or five years the stoppages on the new section of main have been very few indeed; and none have been so bad as those experienced with the old sections still in use. To maintain this favourable state of things, the main is examined and flushed out with ammoniacal liquor every day; so that the dip is always sealed in liquor, and the gases have a free passage. A gentleman who has had great experience in the erection of retort-benches of all kinds, tells me that in his experience the difficulty of stopped pipes really begins with the front and top heat of the settings—that is, the quantity of heat escaping from the front and top of the settings really tends to dry up the tar in the hydraulic main, forming pitch. This interferes with the seal; and the trouble begins. His remedy is not so much increasing the thickness of the front walls or arch of the settings, as to see that there is ample flue and chimney area. The examples cited by him, where enlargement of either main flue or chimney, without any interference of the settings, has caused the stoppages to cease, certainly bears out his contention.

The subject of continuous stoking or carbonization is one that has received a good deal of attention from very early times in the history of gas manufacture. The more recent are the arrangements of Messrs. R. & J. Dempster and Mr. Elliott. It will be in the recollection of many members that Mr. Hack, in October, 1891, read a paper before the Association on Elliott's process of continuous carbonization, in which he gave full particulars of the system and the results obtained at Swan Village with apparatus in practical working. Unfortunately for the inventor, the results did not come up to expectations, owing to trouble in working the process, as well as a great falling off in the yield of gas and reduction of illuminating value.

Messrs. Dempster's arrangements were of a somewhat similar character; and though I, for one, had great hopes of the ultimate success of the process, the inventors, after a long period of experiment, at their own works, gave it up. Their reasons for so doing were that at the time they had begun to perfect the mechanical portion of the plant, the inclined retort system was coming into use; and it appeared to them that if charging and discharging could be done without machinery, it was useless to put up a plant with a machine to each retort, which in a large house would mean a good deal of wear and tear. There was also the difficulty found by Mr. Hack—viz., stoppages of the main with lampblack, caused by the green gas from the freshly-inserted coal travelling over the coke and getting decomposed—and though the gas was taken off at both ends of the retort, the difficulty did not cease. Taking the average make of gas per ton of coal, the results agreed closely with those obtained at Swan Village—viz., between 8000 and 9000 cubic feet per ton. From the results of these experiments, it seems clear that we cannot expect much assistance from any available system of continuous carbonization, unless the results said to be obtained from the Yeadon retort of 12,500 cubic feet of 20 to 22 candle gas per ton of coal are proved to be correct; and of this there does not appear much hope. With a view of adopting the best system of carbonization for a considerable increase of producing power, I made many inquiries as to the comparative advantages of the following systems: (*a*) Regenerative settings fitted with coal conveying, charging, and drawing machinery; (*b*) inclined retorts; and (*c*) carburetted water-gas plant.

The results of the inquiries, which were made nearly two years ago, I propose to lay before you, supplemented by more recent information; and as there is always some difficulty in

getting information of this, inclusive of the same items, I have thought it best to give you the figures exactly as supplied to me. With regard to the results obtained by the use of manual machinery, I had sufficent experience to enable me to decide as to its merits and the saving effected by its use, as compared with hand labour only. It will be remembered that in October, 1894, I read a paper on "The Use of Charging and Drawing Machinery in Small and Medium Sized Gas-Works;" and therein I gave figures proving that the saving which had resulted by the use of machinery was from 8½d. to 1s. 6½d. per ton of coal carbonized. In addition to the saving in wages, I also claimed that the machinery reduced the most arduous work of the stoker, and that a very considerable saving was effected in the time taken to charge and draw the retorts; and, further, that the make of gas was increased per ton and per mouthpiece through the expeditious working and even distribution of the charge. I have often been told of cases where the cost of hand work is very low; but I have never seen figures to prove it possible to come within the range of wages paid for work done by manual machinery by at least 1s. per ton. The saving by power machinery is much greater, but naturally at a much heavier capital cost.

The retort-house we are now fitting up is 88 ft. long, 64 ft. 3 in. wide, by 34 ft. high from coke-floor to eaves. In addition to the retort-house, there is a water-tower, which is divided into three floors as follows: Lavatory on the ground floor, dining-room on the first floor, and reading-room on the second floor. The rooms are each 22 ft. by 13 ft. 9 in. by 9 ft. 6 in. high. A large water-tank, containing 18,000 gallons, forms the roof to the tower. The buildings are of brick, with iron and slated roof. The house at present is being fitted with six settings of eight retorts, 22 in. by 16 in. D's, by 10 ft. long on one side only. The cost of the buildings, roof, and tank is £2355. The cost of the retort-arches, settings, retorts, stage-floor, mouthpieces, and all other ironwork, inclusive of West's manual machinery, with coke-waggons, tram-line, coke and coal elevators, conveyors, coke-screens, coal and coke hoppers, everything being carried out in the best possible manner, is £3256, equal to nearly £67 per retort, or £88 per ton of coal estimated to be carbonized per 24 hours. The house will be ultimately extended to contain fourteen settings of eight retorts each, on each side, or fourteen settings of eight through retorts, 20 ft. by 22 in. by 16 in.

Another house recently fitted up contains eight through settings of eight D retorts, each 22 in. by 16 in. by 20 ft. long; and inclusive of all brick and iron work for arches, chimney, and settings—such as furnace and firing doors and frames, mouthpieces, ascension, arch, and dip pipes, foul and hydraulic mains, valves, retorts, girders, and stage-floor material—including a complete installation of manual machinery, with coal-breakers, elevators, hoppers, and conveyors, the cost was £7924. This is nearly £62 per mouthpiece; or, as I prefer to have the particulars of cost, £76 per ton of coal carbonized—the 20-feet retorts being estimated to carbonize 6½ cwt. of coal each 4 hrs. 48 min. The house is calculated to produce 1,144,000 cubic feet of gas per diem.

The following particulars give the cost of 22 through settings of eight retorts, each 22 in. by 16 in. by 20 ft., inclusive of the settings, retort-bench fittings, furnace and firing doors and frames, mouthpieces, foul and hydraulic mains, ascension, arch, and dip pipes, valves, retorts, and a complete installation of West's power machinery, consisting of coal-breakers, elevators, conveyors, hoppers, and air-compressors, &c.; the total cost being £13,990. This sum does not include stage-floor, buck-stays, tie-rods, and construction of arches and chimneys. The house is capable of producing 3,146,000 cubic feet of gas per diem; the cost per ton of coal carbonized working out at nearly £49.

The following figures relating to the cost of carbonizing with manual machines speak for themselves:—

Working Results with Manual Machinery.

No. of Works.	Description of Work Included in Wages.	Wages per 1000 Cubic Feet of Gas.	Wages per Ton of Coal.	Coal Carbonized per Man.	Gas Made per Ton of Coal.	Weight of Charge.	Duration of Charge.	Wear and Tear of Machinery per Ton.	Remarks.
		s. d.	s. d	Tons. Cwt Qrs.	Cubic Feet.	Cwt. qr. lb.	Hrs. Min.	s. d.	
1	Includes drawing and charging machine men, coke and coal men, picking breeze, and keeping ascension pipes clear.	0 1·77	1 6·40	4 3 0	10,400	3 2 6	6 00	0 0·79	Average wear and tear for ten years.
2	Includes drawing and charging machine men, coal and coke men, pipe jumping, and firemen.	0 1·61	1 5·79	3 19 0	11,122	3 0 0	4 48	..	Wear and tear not given.
3	Includes drawing and charging machine men, coal and coke men, pipe-jumpers, firemen, and exhauster men.	0 1·90	1 9·06	..	11,497	..	..	..	Other returns not given.
4	Includes all items and foreman's wages.	0 1·49	1 4·66	..	11,165	2 3 11	4 48	..	
5	..	0 1·80	1 9·80	..	10,934	..	..	..	Other returns not given.

Note.—In three other cases wages only are given. These are respectively 1s. 6½d., 1s. 2d., and 1s. 7·59d. per ton, inclusive of all retort-house items. The wear and tear of machinery averages 0.64d. per ton of coal carbonized.

For the results of work done in labour saving by power machinery, I must refer you to what is being accomplished at East Greenwich. In May, 1894, Mr. Tysoe, the Superintendent of that station, in his paper read before the Institution of Gas Engineers, gave the cost of the work done by the Arrol-Foulis machinery as 9·3d. per ton, to which must be added 3·2d. for the cost of maintenance fuel, and 10 per cent. for interest and depreciation; making a total of 12·5d. per ton of coal carbonized, compared with 26·3d. for hand work. The results obtained at East Greenwich with West's rope-power machines work out at 9d. per ton, or 0·86d. per 1000 cubic feet of gas made. Forty-eight men with the machinery are now working 26 beds of ten through retorts, or 520 mouthpieces, at a daily cost of £13 6s.; whereas before the introduction of the machinery, it took 101 men, at a daily cost of £27 1s. 6d., to work 15 beds, or 300 mouthpieces. Mr. Hack, in his description of "Labour Saving Plant at Saltley Gas-Works," given us in February, 1895, bore witness to the enormous saving effected by the substitution of power machinery for hand labour.

These examples are sufficient evidence as to the cost of carbonization with the aid of either manual or power machinery. I will therefore now give you particulars of the working and cost of inclined retorts—see table, p. 462.

As a rule, much shorter inclined retorts are used on the Continent than in this country; and in the "JOURNAL OF GAS LIGHTING" for Oct. 12 last, appeared the summary of a report made by a Committee on the sloping retort system to the German Gas Association. The report, as showing what is being done with this system on the Continent, is a valuable one. When we compare the examples of the inclined system with those of horizontal retorts and machinery, we have to acknowledge that, per foot run of retort, a larger amount of gas is made with the former than with the latter—or, at any rate, that is true with the shorter retorts. With regard to cost for labour, I fail to see where any saving comes in, when compared with the items given for both systems. As far as capital expenditure is concerned, I think on the whole the horizontals cost less per ton of coal carbonized; but in all these comparisons, it is very difficult to be absolutely sure that they are made on all-fours. There is, however, one most important matter that I should require greater information upon before putting up inclined retorts, and that is with regard to the relative make of gas per ton of coal with the two systems. It may only be a strange coincidence, but in every case in which I have been able to get information respecting the make per ton, it is low compared with what I and many others obtain per ton of coal carbonized with horizontals. In this connection, I find that the only comparative test recorded by the before-mentioned German Committee of gas experts is as follows: "In comparative trials extending over thirteen days, of retorts of the same section, the average make per ton of coal was 10,168 cubic feet of 15·56-candle gas with the horizontals, equal to 31,622 candles, and 9966 cubic feet of 15·34-candle gas with the slopers, equal to 30,687 candles, showing a loss of 935 candles per ton of coal. The make per mouthpiece was, however, greater with the inclined retorts; but scurf formed more quickly in them." The working of the inclined system will doubtless be much improved in the future; and we may expect to see installations largely increased. But whether the system is destined to entirely take the place of horizontal retorts, is a matter of opinion, the proof of which must be left to time—the great prover of all things.

By the introduction of carburetted water-gas plant, we have received a most valuable addition to our resources. Whether it is used for cases of emergency, or as a regular addition to the ordinary gas production, it is alike valuable. I seriously considered the question of putting up one of these plants; but I

Details of Inclined Retorts.

No. of Installation.	No. of Settings	No. of Retorts in Setting.	Length and Size of Retorts.	Particulars of Installation.	Cost.	Size of Retort-House.	Coal Carbonized per 24 Hours.	Make of Gas per 24 Hours.	Make per ton Cubic Feet.	Illuminating Power.	Fuel Used for Heating.	Cost of Labour per Ton.
1	28	7	..	Inclusive of arches, settings, retorts, and the whole of the ironwork and coal-handling machinery.	£24,963	..	..	..	..	..	..	..
2	6	9	15 ft.; 22 in. × 15 in. tapering to 24 in. × 15 in.	For royalties, brickwork in benches, arches, and chimneys, inclusive of all ironwork, stage-floor, and coal-handling machinery.	£7,125	87 ft. 6 in. long, 50 ft. wide, 35 ft. high to eaves. Cost, £2180.	..	Estimated to produce 800,000 cub. feet; each retort, 14,814 cub. feet.	..	..	..	..
3	..	9	17 ft. long, set to angle of 32°.	Inclusive of all brickwork, ironwork, and coal-handling machinery.	Per Retort, from £75 to £95, according to design.	House for single retorts, 50 ft. wide by 35 ft. high; for double beds, 90 ft. wide.	1 ton 6 cwt. per retort.	13,260 cubic feet per retort.	10,200	17 candles.	8 p. c.	1s. 9d., inclusive of all labour.
4	..	9 but 8 preferred in future.	15 ft. long, set to angle of 32°.	Inclusive of all arches, retorts, and settings, all ironwork and coal-handling machinery.	£110 per retort.	..	1 ton in four charges of 5 cwt. This will be improved upon in future settings.	10,000	10,000	16¼ candles, enriched by oil gas to 19 candles.	15 p. c.	1s. 10d., for all purposes.
5	6	9	16 ft. long, 18 in. × 15 in. □ section, tapering to 24 in. × 15 in., set to angle of 32°.	Inclusive of all brickwork, ironwork, coal-handling machinery, and royalties.	£5,386	..	1 ton per retort.	9,938 cubic feet per retort.	9,938	15·97 candles.	15 p. c.	1s. 1 8½d.
6	12	6	20 ft. long, 24 in. × 15 in. □ section.	Inclusive of all brickwork, ironwork, and coal-handling machinery.	£10,000	120 ft. long by 50 ft. wide and 46 ft. 6 in. high.	100 tons or 1 ton 7 cwt. 3 qr per retort.	1,000,000 cubic feet, or 13,888 c. ft. per retort	10,000	..	..	Under guarantee, 1s. 6½d. per ton. Stokers' work only actually cost this.
7	7	6	20 ft. by 24 in. × 15 in.	Inclusive of all brickwork, ironwork, and coal-handling machinery.	£6,500	..	60 tons, nearly 1 ton 4 cwt. per retort.	600,000 cubic feet, or 14,285 c. ft. per retort.	10,000	..	..	
8	4	6	20 ft. by 24 in. × 15 in.	Inclusive of all brickwork, ironwork, and coal-handling machinery. A very cheaply arranged example.	£3,000	..	..	330,000 cubic feet, or 13,750 cubic feet per retort.	..	..	..	..

found, in getting out estimates of the cost of the apparatus and of manufacture, that our maximum production was not sufficient to warrant me going on with the matter. I also discovered that, owing to the extra carriage on oil so far inland, the cost of manufacture was prohibitory in our case. It was necessary to make a considerable addition to our carbonizing plant; and I got out estimates for horizontal settings with manual machinery, and for a carburetted water-gas plant. The coal-gas plant, which is now being erected, is for a production of 408,000 cubic feet per diem, with a house arranged for extension, and for retorts to be placed back to back at some future time. The estimate for this was £6000. The carburetted water-gas plant was for a production of 370,000 cubic feet of gas per diem. It would have cost, with buildings, plant, relief holder, oil-storage tank, &c., about £5000; and as our maximum make was under 500,000 cubic feet per diem, this would only enable the plant to be used in mid-winter to half its capacity. I had, for this and other reasons before mentioned, to give up the idea. Unless there is a maximum make of 750,000 cubic feet of gas per diem, I cannot see that a carburetted water-gas plant is likely to be an economical substitute for coal gas, except in rare cases. When the production exceeds this quantity of gas, and the carriage of the carburetting material is not excessive, I think carburetted water gas can be economically used in conjunction with coal gas, and that its use will gradually increase. An error often made is that of comparing the 22-candle carburetted gas with coal gas of 16 or 17 candles, as if they were of equal values. It is difficult to strictly compare values of the two gases on the basis even of candle power. With a water-gas plant, the gas manager is enabled to get a much larger yield of gas from the coal carbonized than otherwise, owing to the ease with which the illuminating power of the mixture is kept up; and in making any comparisons between the two systems, this point should receive consideration.

Another system of carbonization has come before us of late years, due to the improved methods of coking coal. My predecessor, in his Inaugural Address last year, alluded to the experiment being tried at Halifax, Nova Scotia; and Mr. Hunt in his able paper read before the Institution of Gas Engineers in May, 1895, entitled "Notes on Residuals," gave an account of the coking-ovens at the Brymbo Works, Wrexham. I was in hopes of being able to supply you with further particulars of the Nova Scotia experiment, but regret news has not come to hand soon enough. Seeing the great possibilities of these processes, as allies to our systems of carbonization, they should be closely watched. I know that Mr. Darby, of the Brymbo Company, has considerable belief in the possibilities of these ovens for illuminating gas purposes; and I think it very possible that, if the ovens and their fittings were designed by the coke expert and the gas engineer in combination, this belief would be fulfilled.

The great improvements that have been made in burners and lighting appliances during the past few years, whereby the illuminating value obtained from a cubic foot of gas is increased to about 18 candles, is having a remarkable effect upon the use and consumption of gas for lighting purposes; and, paradoxical as it may appear, the use of incandescent burners has, on the one hand, rendered the necessity of keeping up the illuminating value of gas almost an absurdity, while, on the other, any reduction is prohibited. This strange condition of things is brought about entirely through the use of bunsen burners and mantles of incandescing material, in which gas is only required to heat the material up to a high state of incandescence, and therefore gas of comparatively low illuminating value is suitable. But the very use of burners like the Welsbach and the Denayrouze, giving illuminating values of from 13 to 18 candles per foot of gas, appears to me to put upon us a duty of giving gas of the highest possible value for use in the ordinary burners. Otherwise the comparison of light given is very much to the disadvantage of the ordinary gas supplied; for we must bear in mind that, though incandescent burners are very largely used, they only represent a small minority of the total number.

I certainly do not favour the advocacy of a reduced value of the gas supplied from 3·2 candles per cubic foot, but would rather see an increase in this direction. The cry is for cheap gas on the part of some; but with others it is for more light. I am not prepared to acknowledge that to furnish a lower quality gas would necessarily mean cheapening the supply.

The question of lighting and ventilation is one of very great importance. Anything that can be done to reduce the vitiation of the air in rooms where gas is used, would certainly be for the public good. I have a great deal of sympathy for those whose duty it is to carry on their occupations day by day in rooms where an illuminant like gas is used with little or no ventilation. We need not wonder at the depressed feelings and bad heads on the part of those so employed, when we see the conditions under which their work is done. The question of efficient ventilation is a difficult one at any time; but it is rendered much more so by the conditions under which labour is carried on in many factories and workshops. If lighting and ventilation were to be always considered by architects in designing buildings, the question would present a different aspect; but unfortunately they are so tied down—generally speaking, on the score of expense—that with the exception of the better-class buildings little or nothing is done to remedy what architects, as well as ourselves, admit to be a serious matter. It is in the ordinary dwelling-house and factory that the want of provision for taking

off the vitiated air and bringing in a fresh supply, is most keenly felt; but for this absolutely no provision is made. The condition of things is often bad enough during hours of daylight; but when artificial illumination is used, the atmosphere becomes almost unbearable. We, as suppliers of the more generally used artificial light, have to bear much of the blame, without the means of remedying the matter. We can only do our part by giving advice, and supplying gas and burners of the best quality; and in this direction I think those of us who carry on a fitting business have great advantages over those who do not. The medical profession often condemn the use of gas stoves and fires in living rooms and bedrooms, on the ground that they are unhealthy. The reason for this may be prejudice in some cases, but more often it is because due care has not been taken to properly connect these to the flue of the chimney, and to see, when so connected, that the products of combustion are being properly carried away. As there is generally a difficulty about fresh air coming into the rooms, it is much better where possible to bring a fresh-air inlet-flue from the exterior of the building to some position near the stove or fire. Mr. W. Sugg shows this, and other excellent ventilating arrangements, in one of his books, which are worthy of close attention.

Our friend and rival the electric light continues to make headway; and yet in spite of it gas is showing year by year largely increased consumption. We have several private installations; and in each instance a gas-engine is used as the motive power. What is most pleasing to me is that in every case the gas consumption has increased since the change was made. There are undoubtedly cases in which electricity can be used to much advantage, though at a greater annual cost than if gas was employed. A few weeks ago there appeared in all our local papers an extract from the "Local Government Journal," which gave an account of what is termed the "first electrically-lighted village." The extract is as follows:—

To the enterprising Parish Council of Treeton, in South Yorkshire, belongs the honour of being the first to establish a system of electric lighting. For a capital outlay of £750, they have provided for the lighting of the whole village by means of powerful arc lamps, one of which is of 3000-candle power. The electrical energy is obtained from the Rother Vale Colliery Company; and it is said that the annual expenses, including the sum required for the repayment of the loan, will be less than if any other means of lighting had been adopted. Parish Councils are not empowered by the Legislature to make their electricity; but they can provide all the apparatus for the actual lighting, and there are doubtless many rural parishes near to large towns or to works where electricity is employed, whose councils may be expected to copy the example of Treeton.

The plant provided for the sum of £750 is as follows: One Brush series dynamo, for direct current, capable of carrying 26 2000-candle power arc lamps in series; output 12,500 watts. Twenty Compton-Pochin arc lamps of 2000-candle power, with wired globes, arc posts, insulators, cables, &c., with automatic cut-outs specially strong for street lighting. The arc lamp-posts are of creosoted pine, 25 feet long, and standing 20 feet out of the ground. Brackets carrying the lamps are arranged to swing out for re-carboning. There are 3½ miles of $\frac{7}{16}$ best quality copper cable, highly insulated with vulcanized rubber. The loan of £750 has been granted by the Public Works Loan Department, over a period of ten years, with interest at 2¾ per cent. secured on the rates of the parish.

The supply of electricity, power, and all repairs and maintenance of lamps, is undertaken by the Rother Vale Colliery Company at an annual charge of £100, which, with the before-named interest and sinking fund means an outlay of £200 per annum. Treeton is a straggling village, with a population of some 2000; the number of houses being about 300. The colliery owners who supply the power would have preferred gas if it could have been arranged; but as the capital outlay would have been some £3000 on a gas-works for the purpose of lighting the village, inclusive of private lighting, the Authorities could not go to that expense. As no one came forward to form a Company, electricity was adopted.

If gas had been available for use in the parish, the capital outlay for 60 gas-lamps, as compared with 20 arc lamps, would have been, for columns, lanterns, incandescent burners, and all fittings, about £195; and the annual cost of lighting, cleaning, and repairs would not have exceeded £75, with gas at 4s. per 1000 cubic feet, on the average meter system. Taking the period of ten years over which the loan extends, the outlay for electricity will be £2000; and the estimated cost of gas plant and gas for the same period would have been £945, or a saving to the rates of £1055 over the ten years. The lighting, I am informed, is very good and perfectly satisfactory; but I am of opinion that 60 lamps of even much less illuminating value would be preferable to 20 lamps at three times the distance apart. I have alluded to this example somewhat at length, because I believe it is the best of its kind; and it certainly behoves us to know what is being done by any of our competitors. Of course, the scheme could not have been carried out if a firm like the Rother Vale Company had not been at hand to provide power and electricity; and for this reason it is doubtful whether the example can be largely followed in other small places.

My other reason for speaking of this matter is to say a few words about the position of gas companies in small and straggling places similar to Treeton, who, to my knowledge, find it extremely difficult to keep their works in an efficient state of order and pay a small dividend to the shareholders. I have no hesitation in saying that many of these companies are badly managed—not necessarily always on the part of the directors or of their manager, but often through circumstances they find it difficult to control. The great drawback to the success of these small companies is the limited business done and the want of greater skill in management. We all know that the directors of such small concerns are not in a position to pay for the skill and knowledge required in managing even a country gas-works. There are, however, two ways by which they may improve their position and future prospects. The first is that when two, three, or four of these small works are in reasonably close proximity to each other, they should amalgamate and form one company, and sell their old property and erect new and central works, with railway siding accommodation, for the supply of the united district. Wherever this plan has been followed, excellent results have accrued. In one instance in which I was instrumental in getting two companies to combine and erect works on modern lines, the improved results were immediately felt; gas being reduced very considerably and dividends doubled. In cases where it is not possible to carry out the foregoing plan, there is no reason why several of these small companies should not combine to form one board of management for the whole of their works. In this way, they could engage a general manager and secretary who could advise them as to alterations or extensions required, and who would take the responsibility of keeping the results obtained in their respective works to a much higher standard than that obtained in the majority of small works at the present day. To companies of this kind, who find difficulty in keeping things going in a progressive manner, I have great confidence in recommending this idea; for I am quite certain that in many cases the active competition of other illuminants will, if nothing is done to remedy the present condition of things, keep them in a state bordering on bankruptcy.

Some of you will remember that at our meeting in November, 1890, I read a paper on "Weekly and Monthly Payments for Gas," with the idea of popularizing the use of gas among small consumers. I then gave you some particulars of our experiments in that direction so far as they had gone, and promised to let you know the future results of the experiments; and I have pleasure in now fulfilling this promise. The time that has elapsed since the paper was read has certainly been long enough to test the ideas then advanced. The results have been fatal to weekly payments. At first we met with considerable success; and as long as most of the weekly customers were in one district, the cost of collection was not excessive for the business done. But after a year or two customers moved (some of them rapidly, and by moonlight), until the end was that only a few were left, which caused the system to be of no real value; and as prepayment meters were in popular favour, we put the remainder of the weekly customers on this system, and ended what was an interesting but unprofitable experiment.

The monthly collections have had an opposite result—in fact, we consider the experiment has turned out a splendid success. When this system was started in 1888, the idea was simply to obviate the necessity of deposits from uncertain customers, and to reduce bad debts from the class of consumer from whom we considered deposits to be necessary. The plan met with so much favour that, in 1890, when opening up a new district, we determined that we would start with monthly collections. The results were so favourable that in February, 1894, my colleague Mr. Kimbell, the Secretary of the Company, was anxious to extend the system to all new customers; and as the Directors had proof placed before them of the advantages derived from the plan up to that date, they consented to this being carried out. So successful have been the results that, on Dec. 31 last, out of 1795 customers, 700 were on the monthly system; and from our experience of the rapid increase during the past four years, it will certainly not be many years before it becomes the only method in use, and quarterly accounts will be with us a thing of the past.

The district previously referred to as being opened up in 1890, is supplied by a separate main direct from the works. The gas, on leaving the works, is registered through a station meter; and as the meters in this district are all taken each month, we are able month by month to check the unaccounted-for gas. This arrangement has been of great service to us, as it enables us to keep the leakage down to 4·8 per cent. on an annual consumption of just over 4 million cubic feet, spread over nearly seven miles of main. During the 7¼ years this district has been supplied with gas, the total sale, to Dec. 31 last, was 19,734,700 cubic feet, of a value of £3734 5s. The total number of bad debts has been three, amounting to £9 2s. 9½d.; and as two of these were caused by the failures of shoe manufacturers, whose share of the debt made was £8 18s. 2d. for only one month's supply of gas, this is sufficient proof of the advantages of the system in reducing the risk and amount of bad debts.

Of course, these frequent inspections and collections cannot be carried out without involving additional work and expense; but the increase is not so great as it may at first sight appear. Our plan of working the system is to send out an inspector, who not only inspects the meter, but makes out the account in a specially prepared book, and in most cases collects the money at the same time. We find this arrangement to work well; only, as a matter of precaution, the inspector should not continuously take the same district, but should every alternate month change

districts with another inspector. The work at the office in entering up the books, though increased in bulk, is of a simpler character than with the quarterly system. The advantages fully compensate for any increased labour and expense involved; while the frequent inspection of the meters keeps us more in touch with our customers, and dissatisfaction is reduced to almost vanishing point. The advantage accruing from the monthly collections of large sums of money are too apparent to need any enlarging upon.

One word of advice to any who may feel inclined to give the system a trial—and that is make the change gradually. I was instrumental a few years since in inducing a board of directors to adopt the plan for their uncertain customers. A year or more ago, owing to a number of serious losses caused by failure of certain firms, the directors decided, against my advice, to make the change throughout their district of supply from quarterly to monthly accounts. The result has been disastrous, as the staff were not able to cope with the work, and the accounts got terribly into arrear; so that customers did not know when to expect their statements. In this case, the inspector took the meters only. The accounts were afterwards made out and collected by the collector—a plan involving more work, and not, in my opinion, so good as that adopted by ourselves.

It is a matter for congratulation that at last steps have been taken to secure due recognition of the merits of sulphate of ammonia as a manure. The Sulphate of Ammonia Makers Committee, by offering prizes through the various Agricultural Societies in Great Britain, are taking a step in the right direction. I am convinced that the only true way of getting farmers and agriculturists generally to recognize the real value of sulphate, is to prove to them, by example, the effect of using it on various crops. Seeing the exhibits, which are sure to be the outcome of the prizes offered by the Committee for competition to the users of sulphate, when visiting the annual show of their county or District Society, is the best means of convincing them that the apparently high-priced manure is after all cheaper in the end than most of the lower-priced ones which are put on the market with high-sounding names. I have frequently been in conversation with farmers in our own district; and it is astonishing what a lack of knowledge there is on the subject of the properties of sulphate, and its relative value compared with other manures. Especially is this the case when comparing nitrate of soda with sulphate. I have been told over and over again that a ton of sulphate was only equal to a ton of nitrate of soda; and if the results of the competitions now instituted do nothing else but prove that the unit of nitrogen in sulphate is equal to the unit in nitrate, a great work will have been accomplished. I do not know why the Committee are not offering prizes this year for grain crops as well as for roots; but I certainly hope that another season they will be able to make adequate arrangements for competitions to take place in the growth of grain and hay crops. There is another way by which I think much good work may be done, and that is by offering, under suitable conditions to properly qualified farmers, free grants of sulphate for experimental work on hay, roots, or grain crops; those having such grants undertaking to keep a careful and true record of the results of their experiment, as compared with their other crops not so manured.

I trust one of the intentions of the Committee is to have sulphate in evidence at the various agricultural and horticultural shows throughout the kingdom. When visiting the Exhibition in Brussels last year, I was struck with the exhibit of nitrate of soda by a Belgian firm acting on behalf of a German nitrate company; and yet in my several visits to the Exhibition, I could not discover any trace of an exhibit of sulphate of ammonia. I think our product needs pushing with the same energy as has been displayed with nitrate of soda. The Dalmeny experiments recently published are of great interest and value, and prove conclusively the value of sulphate for those particular crops.

The Essex County Council have recently carried out some interesting and instructive experiments on the comparative value of manures, under the direction of Mr. T. S. Dymond, F.I.C. The experiments in which sulphate was used were confined to permanent pasture. They were three in number; both sulphate and nitrate being used, but on separate plots. It was found that both manures increased the hay considerably; sulphate giving the best results. It was also proved that both manures injured the quality of the herbage by diminishing the proportion of clover in it.

These experiments have received striking confirmation from a gentleman who buys large quantities of sulphate from us. Last season, when sowing the sulphate for a crop of barley, he left a narrow strip right across the field unmanured, for the purpose of testing the manure. The difference between the strip and the remainder of the field was most noticeable up to the time of cutting the crop. At this time, the manured portion was fully 8 inches higher than the strip. But after the crop had been carted, it was found the unmanured strip gave promise of a splendid crop of clover seeds (grass and clover seeds having been sown to follow the barley); while the manured portion of the field was almost destitute of clover, but strong with grass. The seeds show the same results to-day as last autumn; giving evidence that clovers require little if any nitrogenous manure. On the same farm, the results last season from sulphate were excellent. Fully one quarter more barley of fine quality, with much greater yield of straw, was obtained per acre over other portions of the farms where sulphate was not used. We sell all our make of sulphate locally; the farmer alluded to in the above experiment really acting as our agent. We find this a much better and more economical plan than selling to farmers direct.

In conclusion, I wish to say a few words about the future of the Association. I, as your President, can do very little; the success of the next twelve months depends entirely upon the support given by the members generally. We are fortunate in having our centre in a district and among gentlemen who are ready almost at all times to throw open their works or manufactories to us; and in the past we have derived great advantages from the liberality and hospitality that have been showered upon us. This condition of things is pleasant to us all; but I cannot help feeling that it also presents elements of danger, for we are tempted somewhat to neglect the more solid work of the Association. I would therefore ask every member to be prepared to take his share of the work by preparing papers for reading at our future meetings. Nothing does more to add to the life and vitality of an Association like this than papers evoking good discussions; and though I do not expect our friend Mr. Meiklejohn to have an offer of a paper from each of you during my term of office, I do hope that he will have so many that for a long time to come it will not be necessary to beg for papers. From experience, I can say that great benefits are derived from the preparation of papers. I should like to add that I am very much indebted to those gentlemen who so kindly gave me information for the preparation of the tables which I have had the pleasure of laying before you.

At the close of the address,

Mr. JOHN YOUNG (Norwich) said he was certain he was only expressing the feeling of every member present when he assured the President that it had been with the greatest pleasure and benefit that they had listened to his admirable address. The President had once more forcibly brought before them the axiom that it was in the retort-house that their money was made; and he (Mr. Young) was sure that the manner in which he had treated the retort-house in the address was exceedingly good. He must have spent a considerable amount of time in collecting and tabulating all the interesting information he had brought before them; and the greatest compliment they could pay him would be to study the address with care. With reference to the President's plan of collecting gas accounts, it might interest him to know that the monthly payment system was the rule, he believed, throughout the whole of the United States; and he understood it had been found very successful there. He moved that a hearty vote of thanks be passed to the President.

Mr. CHARLES HUNT (Birmingham), in seconding, said he had listened to the President's eminently practical address with considerable interest. Although he had not been able to follow all the figures, he was sure, when they were published, the members would profit very greatly by them. The address bristled with points; and there was hardly one in which Mr. Lewis's practical mind had not shown itself. He (Mr. Hunt) was particularly struck with his suggestion as to the supply of gas to small villages. The same idea was put forward by him (Mr. Hunt) some years ago, in the course of a discussion on water supply; and he had noticed that within the past few years it had been somewhat extensively taken up, and was approved by the Local Government Board. If the same course were adopted in regard to the supply of gas, he felt convinced that the same satisfactory result would follow. It was true that "union is strength." There was, however, as they knew at the present time, such a thing as too much concentration; but the limit was not by any means reached when these small undertakings became grouped together in a more powerful one.

The motion was carried by acclamation.

The PRESIDENT thanked the members very sincerely for the exceedingly kind way in which they had received his address. If, he said, it had been of any benefit to them, he was amply repaid for the labour involved in its preparation.

THE MAY MEETING.

The PRESIDENT here announced that his Directors had given the Association a hearty invitation to Wellingborough on the occasion of their next meeting; and, on behalf of the members, the Committee had accepted it.

Mr. THOMAS GLOVER (West Bromwich) then read the following paper:—

ACETYLENE GAS: ITS GENERATION AND USE.

The Committee of your Association, at their last meeting, having decided that it was desirable to have a paper on the subject of acetylene gas, I consented, at the request of my colleagues, to contribute such a paper; on the understanding that brevity would not be a disadvantage, so long as it led to a discussion afterwards.

It is not too much to say that the subject of the commercial production of carbide of calcium and acetylene gas, as introduced to the British public by that prince of demonstrators Professor Lewes, created quite a sensation of curiosity and expectation two years ago; and the interest in it does not appear to show much indication of subsiding, as the patent columns of the technical press testify week by week. The manufacture of carbide of calcium on a large scale—from which acetylene gas is made—is entirely due to the recent developments in electrical

science, which have made it possible, by means of the electrical furnace, to obtain higher temperatures than were hitherto known. The fusion of calcium with carbon can only be effected at extremely high temperatures (approximately 3000° to 4000° Fahr.); and it was while using such a temperature in an electrical furnace, that Mr. T. L. Willson, an American scientist, accidentally produced a hard grey slag, which, on analysis, proved to be pure carbide of calcium. The gas evolved when the slag was dropped into water was acetylene. Some time before this discovery was made, the attention of gas engineers had been directed by Professor Lewes to the important part played by acetylene in the ordinary gas-flame; and his clear exposition as to how acetylene was formed, and to what chemical and physical changes luminosity in a gas-flame was due, had no doubt won for his theory many adherents, and served the purpose of drawing public attention more especially to this constituent of coal gas, which previously had been little thought about except by a few experimenters who had attempted its synthetic production, by various means, with only limited success.

The author here, by the aid of a drawing prepared from an illustration of an electrical furnace given in the "JOURNAL" for Jan. 15, 1895 (p. 120), described the process of making calcium carbide, and then proceeded as follows: Carbide thus produced consists of 40 parts by weight of calcium and 24 of carbon (formula CaC_2); and the chemical change which follows when water is added to it, may be represented by this equation—

$$CaC_2 + H_2O = CaO + C_2H_2$$

By the methods of manufacture just described, tons of carbide can be produced with as little trouble as grains were made before. At the present time, about 800 tons of carbide is the annual output in Britain alone; and there are large manufactories on the Continent and in America. Two years ago this production was *nil*. One pound of commercial carbide will produce 5 cubic feet of gas, the estimated illuminating power of which is 240 candles; so that the British production is equal to about 9 million cubic feet of acetylene, or 430 million candle-hours. These figures show that the industry has assumed a position of importance within a short time; and the question which will be uppermost in many minds here will be how far acetylene is likely to enter into competition with the article we make for the purpose of giving the public a supply of light, heat, and power.

To make a comparison, it is necessary to find at what price carbide can be sold to consumers, and what is the candle power which can be obtained from a given weight of carbide under ordinary conditions. For small quantities, £32 per ton has been paid; but it is now possible to obtain large amounts at about £16 per ton. At the latter price, it would appear that there is a fair margin of profit made, or that the wear and tear of machinery and plant must be heavy. The following is the approximate cost of material and labour for producing a ton (2240 lbs.) of carbide:—

1·8 tons of a mixture of 40 per cent. of carbon and 60 per cent. of lime, at 15s. 7d. per ton	£1	8	0
1804 B. T. units of electricity, at 1d.	7	10	4
Labour	0	10	0
Total cost of labour, material, and power . .	£9	8	4*

The power of acetylene is generally quoted as 240 candles for 5 cubic feet, or 48 candles per foot. This, however, is arrived at by calculation from a smaller consumption; and it is not realized in practice, for the reason that no burner has been found, as far as the writer is aware, which will consume 5 feet of undiluted gas without emitting dense volumes of smoke. From experiments which he has made, he has come to the conclusion that 35 candles per foot of the gas is a fairer estimate; and this result was arrived at after using several burners of different construction and size.

Description of Burner.	Gas Consumed per Hour. Cubic Feet.	Corrected Illuminating Power. Candles.	Candle Power. per Cubic Foot.
Bray's No. 0000	1·15	39·55	34·39
Holliday's No. 1	0·55	19·74	35·49
" No. ½	0·70	22·38	31·02
" No. ¼	0·46	11·50	23·00

COMPARATIVE COST IN PENCE OF 1000 CANDLE-HOURS.

Acetylene Gas.

	Pence.
Carbide at £12 per ton	7·35
" £14 "	8·57
" £16 "	9·79
" £18 "	11·02
" £20 "	12·24

Coal Gas (16-Candle) at 2s. 6d. per 1000 Cubic Feet.

Flat flame, developing 3 candles per cubic foot . . .	9·99
Argand, developing 3·2 candles do.	9·36
Welsbach incandescent, developing 10 candles do. . .	3·00

Electricity at 6d. per Unit.

Glow lamp (16-Candle), consuming 60 watts per hour . .	22·50

For the purpose of the above comparison, it is assumed that the acetylene gas would be produced on the premises where it was to be consumed, and that 11,200 cubic feet would be made per ton of carbide. The figures only cover the net cost of the carbide, without any credit allowance for residual lime. It will be observed that, when carbide is £20 per ton, the cost of acetylene is equal to coal gas at about 10s. per 1000 cubic feet when the latter is used with an incandescent mantle.

It has never been proposed, as far as the writer is aware, to distribute acetylene gas from a central works, in the same way that coal gas is distributed; nor is it likely that this will ever be done, as any loss by leakage would add very much to the price which would have to be charged. There would also be many disadvantages attending its use, as compared with coal gas, seeing that the latter is becoming every day of more importance as a convenient fuel. Acetylene can be applied for heating, and for driving gas-engines; but for these purposes it would be about three times as costly as coal gas.

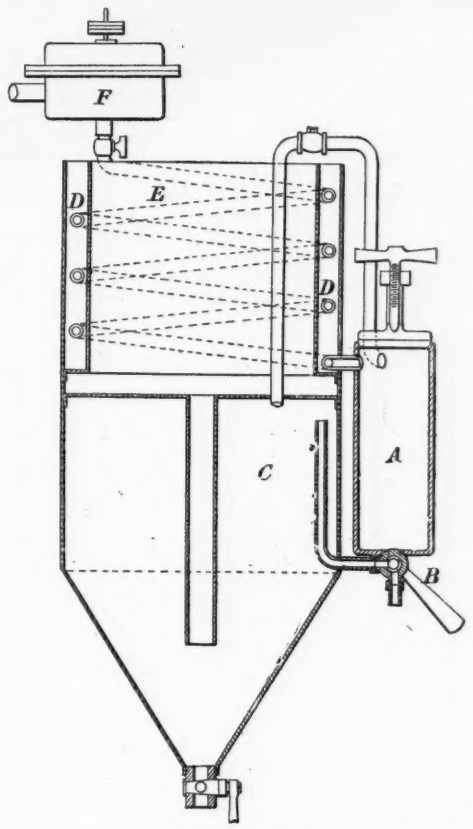


FIG. 1.—SECTION OF THE ACETYLENE GAS GENERATOR.

Coming now to a description of the generating apparatus, fig. 1. shows a section of one of Messrs. Read Holliday and Sons' Type "D" machines. A is the generator, in which carbide is suspended in a cage, and subjected to the action of water. B is a valve with a hollow plug connecting the bottom of the generator with the vessel C. A pipe, with a back-pressure valve, also connects A to C, to take any excess gas formed when the taps connected to the generator are all closed. The top of the generator is connected to a cooling-worm D, which surrounds the upper vessel E, but is separated from it by an annular casing; the outlet of the worm being at the governor F. The upper and lower vessels C and E are connected by a tube, reaching to about two-thirds the depth of C. The valve at the bottom of C is used for flushing out any fine sediment which may be deposited.

Gas making is commenced by charging the cage with carbide—placing it in the generator; and when the cap is tightly screwed on, the valve B is opened, and gas is at once made ready for use as required. If the demand for gas is less than the quantity being generated, the back-pressure forces the water from contact with the carbide into the vessel C until, by the pressure on A becoming less, the water again flows, and the production of gas is continued. In this type of apparatus, where a small quantity of water is brought into contact with a comparatively large quantity of carbide, there is a considerable rise of temperature in the generator; hence the importance of having a sufficient cooling surface to prevent water vapour being carried forward, which, on being condensed in the consumers' pipes, would give trouble. The gas thus produced may be burnt through ordinary gas-fittings; but special burners are required for its use, since, by reason of its extreme richness, the orifices of burners of the union-jet type must be extremely small, and these have a tendency to stop after burning 100 hours or so.

* In connection with these figures, Mr. Glover remarked that he had assumed that the electricity was generated at a place where the power could be obtained at a low cost.

Fig. 2 shows a section of a burner which has been specially designed to overcome this difficulty, by arranging steatite hoods at an angle on the top of the burner, and over the gas-orifices; the hoods being open to admit air at the base. The flame is produced in the same manner as in the union-jet burner, by impinging jets; but the gas orifices are not in contact with the flame, and are not therefore liable to get choked with carbon.

FIG. 2.—BURNER.

You will observe that purification of the gas is unnecessary, if ordinary care is exercised in the choice of coke and lime at the carbide factory. Acetylene gas has a strong smell; it is colourless, soluble in about its own volume of water, and has a density of 0·92. The quality of the light emitted is almost equivalent to sunlight, and is in this respect superior to any other known form of artificial light. It is therefore specially valuable for judging colours, and for photographic purposes. Owing to the small amount of gas required to be burnt for a given illumination, the air vitiation is less than with ordinary gas-light. The temperature of the flame is also in its favour; being only 900° Fahr., as against 1400° for coal gas. These are some of the considerations favourable to acetylene gas, which show that it is well adapted for many special purposes; and if the Welsbach burner and mantle had not been introduced for use with ordinary coal gas, and such excellent results obtained therefrom, it is possible that acetylene might have become a much more serious rival than it is likely to be now.

Having dismissed from our minds any undue fears as to competition, we may calmly consider for what purposes, and under what conditions, acetylene can be applied. It has been very properly suggested that for isolated buildings—such as wayside railway station, and country mansions, where a public supply of coal gas is not obtainable—the new light will be specially applicable. It possesses many of the conveniences of coal gas, without the disadvantages which attend its manufacture on a small scale; and as compared with private installations of electric light, there would be no delicate machinery requiring attention. The operations connected with producing the gas from the carbide are so simple that it is easy to believe that an installation for a country mansion or hotel could be worked by an intelligent gardener or other servant; and the advantages of such an installation would be great as compared with oil-lamps. For lighthouses, light-ships, and buoys round our coasts, it is difficult to imagine any light which would equal that obtained from acetylene gas.

The unfortunate accidents from explosion which have occurred when the gas was put under compression, have compelled the authorities to place severe restrictions on its use when compressed; otherwise its adoption for some of the above purposes would have made much more progress than is the case at present. Danger of explosion when the gas is under compression may be minimized by dilution with other gases, and probably coal gas may be used for this purpose. Although acetylene has not proved a cheap enricher of coal gas on a large scale, where one or two candles of enrichment only were required, the latter forms an excellent diluent for acetylene, as it enables the gas to be burnt under better conditions for developing its illuminating power than when used alone.

If time had permitted in the preparation of this paper, an interesting set of experiments might have been made to show the value of acetylene with various percentages of coal gas, and the cost of producing (say) 1000 candle-hours with such mixtures. Perhaps another member of the Association will take this up, and give the results of his investigations at a future meeting.

Apart from its value as an illuminant, acetylene does not appear to be of much commercial value at present, though it may be known to you that other valuable hydrocarbons can be readily produced from it—such as benzol, ethylene, &c. But whether it will ever pay to manufacture these or other products usually made from coal tar, remains to be proved.

[During the reading of the paper, the room was illuminated by means of four burners supplied with acetylene gas from one of Messrs. Read Holliday and Sons' generators, the action of which was examined with interest by several of the members at the close of the meeting. At the conclusion of the paper, Mr. Glover, in order to show how readily gas was given off by calcium carbide, placed a small piece in a dish of water, covering it by inverting a glass funnel. The rapidity with which the gas is generated was shown by the immediate agitation of the water, and by the ignition of the gas on the application of a light directly afterwards at the pipe end of the funnel.]

The PRESIDENT, in proposing a hearty vote of thanks to Mr. Glover for his interesting communication, mentioned that about two years since he made a few experiments with carbide of calcium. At that time he had great difficulty in getting a supply. He had to wait quite three months for it; and then had to pay 1s. per lb. His experiments were not so much in regard to the employment of acetylene gas for lighting purposes, as in its use in lanterns for dissolving views. However, he was not successful in this direction. Regarding the burners Mr. Glover had exhibited, he (the President) saw similar ones in use in Brussels two years ago.

Mr. P. SIMPSON (Rugby) seconded the motion, which was cordially endorsed by the members.

Mr. GLOVER, in responding, said he regretted he had not had time to deal with the subject in a more adequate manner. He started the paper with the feeling that the subject was of little interest to them as gas engineers; but as he proceeded with the preparation of the paper, its interest and importance grew.

THE STANDARDIZING OF METER-UNIONS.

The HON. SECRETARY read a letter he had received from the Secretary of the North British Association of Gas Managers (Mr. R. S. Carlow, of Arbroath) on the above subject. Mr. Carlow, in his communication, said he was instructed, at the last meeting of the Committee of the North British Association, to communicate with kindred Associations regarding the proposal to standardize meter-unions, and to invite them to co-operate in the object in view. He suggested that, in the event of the proposal being favourably received, a Sub-Committee from each Association should meet in London, or some other convenient centre, in order that the whole subject might be fully discussed. The letter was accompanied by copies of the reports of the proceedings of the North British Association for the three past years; and from the copy for 1897, Mr. Meiklejohn read an extract referring to the question.*

The PRESIDENT agreed as to the necessity of standardizing meter-unions. The difficulty which prevailed in respect to these unions was due very much to the fact that the London makers had one standard and the Edinburgh makers another; and the unions were consequently not interchangeable, as they should be. Gas managers, however, had a simple remedy. When giving orders for meters, they could instruct the manufacturers to make the unions interchangeable; and if they would not do so, then they could decline to give them orders. Being such a simple matter, he thought that, if the meter makers were approached, they would soon put an end to the difficulty.

Mr. W. C. JONES (Kingswinford) considered it advisable that the Association should entertain the proposal of their North British friends. At present, he remarked, a gas manager was tied down to some extent to one maker, unless he had many different sizes of meter-unions in his district; but if they could legalize the standards throughout the country, in a few years all their meters would be fitted with standard sizes of unions. If, however, they left the matter to individual managers, what one might prefer his successor might not like. Those in charge of small works especially knew the disadvantage of having meters with different unions. If anything could be done by them as an Association, they ought to do it; and he should therefore be pleased to propose that a Sub-Committee be appointed to confer with the Committees of other Associations with the view of legalizing standards for meter-unions.

Mr. R. O. PATERSON (Cheltenham) said there could only be one opinion as to the advisability of standardizing the unions of meters. He thought it would be better, perhaps, if the meeting decided to leave the matter in the hands of the Committee of the Association, with authority, if considered expedient, to send a deputation to confer with deputations from other Associations, or at all events to deal with the matter in any way they thought fit. It was not for the members to discuss the merits, or the *pros* and *cons.* of the question, at such a meeting as that. If Mr. Jones would withdraw his motion, he (Mr. Paterson) would propose that the matter be referred to the Committee with power to send a deputation to the suggested conference if thought desirable.

Mr. JONES said he should have pleasure in withdrawing his motion, and seconding that proposed by Mr. Paterson.

On being put to the meeting, Mr. Paterson's suggestion was unanimously adopted.

This concluded the business on the *agenda;* but, before separating, the members partook of high tea.

Society of Engineers.—At the meeting of this Society at the Royal United Service Institution, Whitehall, next Monday, a paper on "Reservoir Embankments, with Suggestions for Avoiding and Remedying Failures," will be read by Mr. W. Fox, M.Inst.C.E. He will deal with the depth and form of the foundation for the puddle trench, the form of the embankment, the material used, and the mode of construction. Several existing reservoirs will be cited in illustration of the points brought forward.

The "Electrician" Electrical Trades Directory and Handbook for 1898, a copy of which we have received from the publisher (Mr. G. Tucker), furnishes abundant evidence of the growth of the electrical and allied industries. This is the sixteenth year of publication; and the present edition surpasses its predecessors in accuracy and completeness. The large sheet tables included in the book show at a glance the progress made in the establishment of stations for the supply of electricity, especially during the past eight years. An important section of the book deals with the Far East (including Japan); while the Biographical Section, which is freely interspersed with portraits contains many interesting particulars of men whose names have become familiar in connection with electrical science. The "Directory" is issued by the "Electrician" Publishing Company.

* See "JOURNAL," Vol. LXX., p. 267.

MANCHESTER DISTRICT INSTITUTION OF GAS MANAGERS.

The Twenty-eighth Annual Meeting of this Institution was held in the Grand Hotel, Manchester, last Saturday. At the commencement of the proceedings, the chair was occupied by Mr. R. PORTER, of Elland, the retiring President.

The HON. SECRETARY (Mr. S. S. Mellor, of Northwich) read the minutes of the previous meeting, which was held at Bradford on Nov. 27, 1897; and they were duly confirmed.

NEW MEMBERS.

Mr. H. Peaty (Burslem) and Mr. F. W. Johnston (Mossley) were unanimously elected members of the Institution.

THE REPORT AND ACCOUNTS.

The HON. SECRETARY read the report of the Committee, who stated that, during the past year, twenty-nine new members were elected, two had resigned, two ceased membership under Rule 1, and one under Rule 17—leaving 130 members now on the roll. After detailing the business transacted by the Institution during the year of Mr. Porter's presidency, the report concluded: "Your Committee are glad to note the growing influence of the Institution, and acknowledge the assistance rendered by the attendance of the younger members at the meetings. They take this opportunity of soliciting the continued assistance of the members, so that the success which has hitherto attended their efforts may be extended, and in the future become more prosperous and beneficial." The accounts were taken as read.

Mr. R. HUNTER (Chester), in moving their adoption, said there was nothing particular to remark about the accounts, except that he was rather surprised to see that there was the sum of £13 6s. 6d. outstanding for subscriptions. There was one very pleasing thing to be noticed in the accounts, and that was the item of 5s. for interest. He did not remember that any interest had been received on their money hitherto.

Mr. A. H. SMITH (Darwen) seconded the motion; and it was carried unanimously.

ELECTION OF OFFICERS.

Mr. ISAAC CARR (Widnes) proposed that Mr. Shadbolt should be elected Senior Vice-President. He said Mr. Shadbolt was not a member of the Committee; but this was not the first time that they had gone outside their own body to seek for a gentleman to fill the office of Vice-President, or even President. In the present instance, he thought a very proper course had been pursued. He had heard it said by gentlemen unconnected with the Manchester Institution that a special feature about it was that it was headed by strong and vigorous men. Whether or not this statement had been justified, was not for him to say; but whatever its justification in the past, it would be doubly true in the future if his nomination were accepted. In Mr. Shadbolt they had a gentleman of vigorous intellect and action, who had proved himself to be in the van of all matters in connection with the advancement of their profession; and in his term of office he (Mr. Carr) predicted they would have a year second to none that had preceded it.

The HON. SECRETARY had much pleasure in seconding the nomination of Mr. Shadbolt, who had previously contributed to their proceedings in a worthy manner.

The PRESIDENT expressed his pleasure in supporting the proposition. He said he believed they would have in Mr. Shadbolt a gentleman who would adorn the chair, and bring forward something useful to the members.

The proposition was carried unanimously.

Mr. W. NEWBIGGING (Manchester) then proposed the election of Mr. G. E. Stevenson as Junior Vice-President. He remarked that "good wine needed no bush;" and it was unnecessary to enter into Mr. Stevenson's qualifications for the office.

Mr. E. A. HARMAN (Huddersfield) seconded the proposition with much pleasure. The meeting being held in Manchester, the occasion was singularly opportune for doing honour, not only to the Manchester Gas Department, but to the Institution itself, by electing Mr. Stevenson as one of their Vice-Presidents.

The resolution was unanimously carried.

Mr. W. W. HUTCHINSON (Barnsley) proposed the re-election of Mr. T. Newbigging as Treasurer. He did so with every confidence, as he believed him to be a man of very high integrity. Reference had been made to an item for interest figuring in their accounts. This showed that there was an accumulation of funds which did not formerly exist.

Mr. W. SMITH (Hyde) seconded the proposition, which was agreed to.

The PRESIDENT said the office of Secretary was a very important one; and it afforded him very great pleasure to propose that Mr. S. S. Mellor, who had done the work so well in the past, should be re-elected.

Mr. J. BRADDOCK (Radcliffe) said it needed very few words from him to commend the resolution to the acceptance of the members. They all knew the desirability of securing Mr. Mellor's services; and he was sure the members would on the present occasion repeat their former action in re-electing him as Honorary Secretary.

The proposition was carried unanimously.

Mr. MELLOR thanked the meeting for his re-election. He said he would endeavour to discharge his duties quite as well in the future as he had done in the past. He had the best interests of the Institution at heart; and this was one reason why it gave him pleasure to continue the work.

Mr. R. G. SHADBOLT (Grantham) said some men were "born great," while others "had greatness thrust upon them;" and he thought he might congratulate himself upon being put in the latter position that day. No greater honour could have been conferred upon him than his election as Senior Vice-President; and if his observations in returning thanks were brief, it was owing to the sense of gratitude he felt. He was sorry his brother Vice-President was not present to respond for his election; but the very fact of Mr. Stevenson being placed in the vice-chair caused a vacancy on the Committee. He thought the Committee had made a very wise choice in selecting Mr. Townsend, of Wakefield, to serve for the balance of Mr. Stevenson's term of office. Mr. Townsend had long proved himself to be a capable and energetic gas manager; and he was one who, to use his own expression, would rise to any emergency that might occur in the future. He therefore had great pleasure in proposing his election as a member of the Committee.

Mr. W. SEVERS (Wilmslow) seconded the motion.

The PRESIDENT called attention to the fact that, although Mr. Townsend was only elected for one year, he would be eligible for re-election when this period expired.

The resolution was adopted.

Mr. H. HAWKINS (Todmorden), in proposing the election of Mr. S. R. Ogden, of Blackburn, said he was submitting the name of a gentleman who was well known to the members of the Institution. He was sure there was no one present who would fail to give Mr. Ogden his hearty support.

Mr. A. GRAHAM (Mansfield) seconded the resolution, and it was carried unanimously.

On the motion of Mr. T. DUXBURY (Middleton), seconded by Mr. W. MOYS (Ossett), Mr. T. N. Ritson, of Kendall, was elected on the Committee.

Mr. HARRISON VEEVERS (Dukinfield) moved the re-election of Mr. W. Smith and Mr. T. Duxbury as Auditors of the Institution; and at the same time proposed that a vote of thanks should be accorded to them for their services during the past year.

Mr. W. PRINCE (Stoke-on-Trent) seconded the motion; and it was passed.

Mr. SMITH briefly returned thanks.

INTRODUCTION OF THE NEW PRESIDENT.

Mr. PORTER, in inviting his successor—Mr. W. S. Haddock, of Warrington—to take the chair, said he was sure the members would be very glad to see a change in the presidentship. For his own part, he did not object, although it had been a very great pleasure to him to fill the position. He wished to thank all the members for the assistance and encouragement they had extended towards him during his year of office; and he solicited the same consideration for his successor. He was sure Mr. Haddock would prove himself a worthy President, and one of whom they would all be very proud.

Mr. HADDOCK then took the chair.

The PRESIDENT said, before reading his Inaugural Address, he would ask the members to return a hearty vote of thanks to the retiring President. They were all aware of the intense interest Mr. Porter had taken in the Institution during the past year, the very great progress the Institution had made, and the knowledge that had been gained by the members, due to Mr. Porter's guiding spirit. It would be seen from the accounts that, notwithstanding the amount of work done, their funds were growing.

Mr. HUTCHINSON expressed his pleasure in seconding the proposition. He thought he would be echoing the sentiments of the members generally when he said that Mr. Porter had proved himself to be the right man in the right place during the past twelve months.

The resolution was passed by acclamation.

Mr. PORTER said he was exceedingly obliged to the members for the vote of thanks they had so unanimously passed. He had endeavoured to do his duty, although, no doubt, in the eyes of many people, and especially in his own, he had failed in many things. At the same time, he hoped they would accept the little services he had rendered as coming from one who had at heart the interests of the Institution and the members generally. He had endeavoured to increase the knowledge which the Institution was the means of spreading; but he was afraid he had failed in this respect.

The PRESIDENT then read the following

INAUGURAL ADDRESS.

Gentlemen,—I thank you for the honour you have conferred upon me by electing me your President for the ensuing year; and while I fully appreciate the difficulties before me, in filling a position which has been held by so many able engineers, I hope to carry out the duties of President in a manner which will be creditable to the Institution. I shall try to prove myself worthy of the trust you have placed in my hands.

An Institution of this kind is very valuable in bringing together the gas engineers of the district. It confers upon its members the benefits to be derived from the papers which from time to time are read upon subjects of the greatest importance and interest to all gas engineers, and the discussions arising therefrom, and in disseminating information with reference to the various new processes, patents, and discoveries, which are

constantly being introduced, and the experience gained by the different members in the practical working of the same.

I am very pleased to find, from the Report of the Committee, that the Institution is in a very flourishing condition, and the membership is steadily increasing. I would remind you that, while we number 130 members, there are yet a great many gas engineers within the district who have not joined us; and I would urge on the members who have friends who are gas engineers in the district, to impress upon those friends the advantages to be derived from joining the Institution.

The duties of a gas engineer or manager are primarily to produce pure gas of stated quality, at the lowest possible price. To carry out these duties successfully, it is necessary that he should obtain a good supply of coal at a fair price, work it up in a scientific and economical manner, and dispose of the bye-products in the best markets. In the purchase of coal, it is usual to invite tenders for one, two, or three years' estimated consumption. Frequently as many as thirty to forty tenders are received, varying in price from as low as 7s. 6d. up to 15s. per ton delivered at the works.

This coal has to be valued according to the quantity and quality of gas, coke, tar, and ammoniacal liquor which can be extracted from it. Cyanogen may be included among the bye-products, where it can be recovered in such quantities as to make it profitable. When I was first called upon to recommend the purchase of a particular coal, I found that this was one of my most arduous and anxious duties. Warrington being situated in proximity to the Wigan and St. Helen's coalfields, the tenders from the Manchester, Yorkshire, Staffordshire, and North Wales coalfields generally proved to be of too high a price to compete with coal from the neighbourhood of Warrington, in consequence of having to add 2s. to 3s. extra for freight.

In arriving at the value of a coal, it is of great advantage to know as much as possible of the various seams of coal from which your supplies are obtained, and I have found much valuable information in Baines's "History of Lancashire and Cheshire, Past and Present," from which I have extracted the following information.

The coalfield of Lancashire and Cheshire is one of the richest and most productive in Great Britain. It extends from north to south; commencing in the north at Colne, in Lancashire, and running southward to Congleton, in Cheshire. At its broadest point, it is about 40 miles in width; extending from Todmorden on the Yorkshire border, to Whiston near Liverpool. The area is some 400,000 acres, or about one-fifth of the area of the counties of Lancashire and Cheshire. This coalfield contains about 120 seams of coal, upwards of 30 of which are now worked.

The coalfield of Lancashire and Cheshire is usually divided into three divisions. These three divisions are: First, the upper, or Manchester, coalfield at Ardwick, Manchester; secondly, the middle, or principal, coalfield, extending completely across Lancashire, from Oldham and Ashton in Lancashire and Dukinfield and Poynton in Cheshire, to St. Helen's and Wigan; and, thirdly, the lower coalfield, so called from having been originally deposited at the lowest depth of the sea, but which has now been forced to the highest level by internal convulsions, and extends over a great part of the hilly and mountainous regions of South Lancashire and Cheshire.

The upper, or Manchester, coalfield, at Ardwick, contains some 15 seams of coal, and the aggregate thickness of these seams is 30 feet.

Plans of the middle coalfield, drawn in 1865 by Mr. Dickinson, Inspector of Mines for the Manchester District, give the various strata of coal in four different districts: First, the district lying between Manchester, Bury, and Bolton, including the mines of Pendleton, Patricroft, Worsley, Atherton, and Hulton, containing 100 seams of coal, and the aggregate thickness of coal in which is upwards of 140 feet. Secondly, the neighbourhood of Oldham, Ashton, Stalybridge, and Stockport, including the mines of Dukinfield, Ashton, Oldham, and Poynton, containing 92 seams of coal, and the aggregate thickness of which is 126 feet. Thirdly, the St. Helen's coalfield, containing 44 seams of coal, of the aggregate thickness of 74 feet. Fourthly, the Wigan coalfield, containing from 58 to 60 seams of coal, of the aggregate thickness of 62 feet.

The seams of coal in the lower coalfield are of great extent, running through the whole of the more hilly districts of Lancashire and Cheshire. In some places, coal is obtained at elevations of 1500 feet and even 1800 feet above sea level. There are 15 seams in this coalfield, having an aggregate thickness of 10 feet.

The Lees, or Dogshaw coal—a rich seam, 5 feet thick, in the Oldham district—is the last thick seam of coal, and is identical with the lower Woodley mine of Dukinfield, the Riley mine of Oldham, and the Arley mine of Wigan. At Harwood, it is very thin. The most complete section of the Wigan coalfield is probably obtainable at Pemberton, Springs Branch, and Bamfurlong, and is shown in the following table.

The seams above of cannel cover only small areas. There are three seams of cannel in the Wigan district—the Wigan four-feet, the King cannel, and the Wigan cannel. Collieries situated within a short distance of each other may raise two entirely distinct seams of cannel; and as cannel varies so much in quality, it is very important to know the exact seam from which it has been mined. The King coal and cannel increases in thickness from Bamfurlong, where it completely runs out, to Norley and Pemberton, where it is 2 feet in thickness. The Wigan cannel does not appear in the above table. It is a separate seam from the King cannel, and is worked by the Ince Coal and Cannel Company, the Elms Colliery, and the Wigan Coal and Iron Company. This seam lies just above the King coal.

Section of the Wigan Coalfield.

Names of Mines.	Pit No. 1. Thickness of Mines.			Pit No. 1. Depth of Mines from Surface.	Pit No. 2. Thickness of Mines.			Pit No. 2. Depth of Mines from Surface	Price per Ton at Pit.	
	Yds.	Ft.	In.	Yards.	Yds.	Ft.	In.	Yards.	s.	d.
First Yard	1	0	1	84		—		—	8	3
Second Yard	1	0	3	94		—		—	8	3
Ince 4-feet	1	1	8	125	1	1	4	63	8	6
„ 7-feet	1	1	0	139	0	2	3	93	7	0
„ furnace	1	0	4	161	0	1	4	113	6	9
Pemberton 5-feet	1	1	10	241		—		—	7	0
„ 2-feet*	0	2	0	249	0	1	5	207	9	0
„ 4-feet*	1	1	2	268	1	1	4	220	9	0
Wigan 5-feet†	1	1	10	400	1	1	0	345	7	0
„ 4-feet† (*a*)	1	1	5	432	1	0	4	381	7	6
„ 6-feet§	2	1	9	458	2	1	0	411	7	0
Cannel		—		547	0	0	8	475	16	0
King coal‡		—		550	1	2	2	475	7	6
Ravine‖		—		597	3	0	1	503		—
Yard	0	2	8	631	0	3	4	525	8	0
Bone		—		—		—		—		—
Smith or Orrell 5-feet†		—		—		—		—		—
Arley or Orrell 4-feet¶	1	0	6	710		—		—	11	0

* First-class house coal. † First-class steam coal. ‡ Gas coal. § First-class steam and second-class house coal. ‖ Steam coal. ¶ Gas and house coal.
(*a*) With 5 to 15 inches of cannel.

The following is a short table showing laboratory tests of coal and cannel in the Wigan district:—

Laboratory Tests of Coals and Cannels.

Name of Coal.	Cubic Feet of Gas per Ton.	Illuminating Power in Candles.	Coke in Pounds per Ton.	Ash in Coke, per Cent.
Wigan 4-feet cannel	15,400	39·88	1080	9·00
„ 4-feet coal and cannel	10,280	20·53	1368	6·00
Wigan 4-feet coal only	11,400	16·90	1320	8·62
Arley coal	12,000	18·41	1493	5·00
„ yard	11,100	18·57	1431	8·00
King cannel	12,100	23·58	1312	5·00
Wigan cannel	12,735	22·60	1415	4·98

The Lancashire coals taken as a whole are a superior class, yielding a good coke, and comparatively free from earthy or other impurities. Among these, the Wigan Arley mine may be regarded as almost the highest type of a gas and coke producing coal; and, taking the two qualities together, it is the best in the Lancashire district.

The following table shows the total quantity of coal raised and carbonized in the United Kingdom from 1894 to 1896:—

Year.	Total Quantity Raised. Tons.	Average Pit Price.	Coal Carbonized. Tons.	Gas Made. Cubic Feet.
1894	188,277,000	6s. 8d.	11,319,301	114,295,680,640
1895	189,661,000	6s. 0½d.	11,937,446	121,421,752,691
1896	—	—	12,296,739	127,041,603,412

Each gas engineer has to be guided by his own experience with regard to the particular kind of coal which it is most economical for him to purchase to produce gas of the required quality, which may vary in illuminating power from 14 to 22 candles. The quality of the coke and other bye-products must be taken into consideration. In many districts, members have succeeded, owing to favourable circumstances, in obtaining upwards of 75 per cent. of the first cost of the coal from the revenue derived by the sale of bye-products. The selection of coal also raises the important question of enrichment. At the works in charge of our members, the great majority enrich the coal by the addition of cannel only; other members use other processes, either in addition to, or without cannel. I find, from replies I have received in answer to a circular sent to the members, that all the well-known systems are in operation in the district. The following is a table showing, as far as I have been able to ascertain, the various enrichment processes in use in works in the district in charge of members of the Institution, with the extent of that use, and the cost. It will be seen from the table that the cost of enrichment with cannel varies considerably. At some works, where cannel can be purchased at a lower figure than coal, the enrichment costs nothing; at other works, the cost rises as high as 2d. per candle per 1000 cubic feet. Mr. Glover, of St. Helens, in replying to my circular, stated that by adopting the Peebles process he was enabled to work up a lower grade coal, which is raised in his district.

The Corporation of Warrington enrich with cannel; and I have not been able to find a sufficient reason to recommend them to change the process, though I admit I have been unable to go into the subject of enrichment by carburetted water gas to the extent our last President has done. This system, though not economical at Elland, must have been found so in many

places, as it is being extended in London, Birmingham, Liverpool, and other towns, and adopted in Middlesbrough, Stockport, Halifax, and other places. Up to the beginning of last year, I estimate that carburetted water-gas plant had been erected for the production of 41 million cubic feet of gas. Since that time I am informed that orders have been received for plant to produce 27 million cubic feet per day.

Processes and Cost of Enrichment.

No. of Works.	Process.	Extent in Candles.	Cost per 1000 Cubic Feet per Candle in Pence, and Remarks.
1	Peebles	15 to 18¾	0·50
,,	,,	,, 18	0·93
,,	,,	,, 20	0·36 (material only)
,,	,,	17 ,, 21	0·75
,,	Maxim-Clark	15½ ,, 20½	1·00
,,	,,	,, 18	
,,	,,	No details.	
,,	Carburine	to 17	
,,	Carburetting spirit	,, 17¾	
,,	,, ,,	,, 17½	
,,	Carburetted water gas	,, 19	
,,	,, ,,	,, 18½	
,,	,, ,,	,, 20	
,,	Self-enrichment	,, 15	Nil
,,	,,	,, 17	,,
,,	,,	17½ ,, 18	,,
,,	Tatham's oxy-oil	,, 19	
,,	Dinsmore	16½ ,, 19	
54	Cannel only	..	Nil to 2

Owing to the adoption of carburetted water gas and other enrichment processes, the price of cannel has been considerably reduced, to the benefit of those works where it is solely used. The Wigan four-feet cannel, which was sold at 41s. per ton at the pit in 1892, can now be purchased at 23s. per ton. The second grades of cannel are much reduced in price; but they have not fallen in value to the extent of the rich seams.

From the Board of Trade returns and other information, I have ventured to estimate the amount of cannel which was formerly used, but is now dispensed with at the various gas-works in the United Kingdom.

Enrichment Material other than Cannel used in the United Kingdom.

Enricher.	Quantity Used. Gallons.	Cannel Equivalent.† Tons.
Petroleum oil	46,312,324	617,491
Petroleum spirit*	1,785,083	35,701
Total	48,097,407	653,192

* Includes naphtha, benzol, carburine, and canneline. † 50 gallons of spirit and 75 gallons of petroleum oil taken as equivalent to 1 ton of cannel, yielding 12,000 cubic feet of 34·8 candle gas.

There have been no important changes in the processes for the manufacture of gas of recent date. In the retort-house, regenerative settings for heating the retorts and stoking machinery are rapidly being brought into more general use. The inclined-retort system is also extending. Up to twelve months ago, there were 4091 retorts built upon this principle. The Secretary of the Automatic Coal-Gas Retort Company, Limited, reports that there are now over 2024 retorts in contemplation, or an increase of 50 per cent. By the use of the inclined-retort system, the Brentford Gas Company report a saving of 1s. 7d. per ton over manual stoking. There are few large works that have not availed themselves of one or other of the many excellent mechanical systems in use for economizing hand labour.

The present system of purifying gas has been general during my experience; whereas much progress has been made in all the other sections of manufacture. The use of the Wanklyn bottle for estimating the quantity of impurity in the gas enables the manager to direct the operations of the purifiers with more certainty and greater economy. An advantage is to be derived by having fewer boxes of greater area, rather than more boxes of reduced area. The boxes at the Warrington works have recently been reduced to one-half in number and more than doubled in area, by coupling together two adjoining boxes. When purifying the same quantity of gas, the larger boxes give from 25 to 50 per cent. more duty per square foot than was obtained prior to the alteration. Those members who visited the Preston Gas-Works in May last, saw purifiers of immense area. These purifiers Mr. Green finds cheap to erect, and very economical to work. [For a description and sketch of these purifiers, see "JOURNAL OF GAS LIGHTING," Vol. LXVI., p. 918.] Similar purifiers have recently been erected at the Sheffield Gas-Works. A new and more satisfactory method of purifying gas than the one now in use is much to be desired. The opening of the purifiers always gives rise to some danger; and many accidents have arisen in the purifying of gas as now carried on. The work to be performed is of a disagreeable nature, and to some extent objectionable to those living in the neighbourhood of a gas-works. A large area of land is required; and the building and plant are costly both to erect and maintain. The paper by Mr. Stelfox on the Claus system will deter many gas companies from making further trials on similar lines. This is to be regretted, as the Belfast working shows that gas can be purified by this process. The cost appears to be due to the loss of ammonia in the carrying out of the process. Theoretically there is no loss; and the system is an ideal one on paper. We are all indebted to the Belfast Corporation for the persistent manner in which they have persevered with the Claus process, and also to Mr. Stelfox for making known to us the results of their investigations.

The production of sulphate of ammonia continues to increase, as shown by the following figures taken from Messrs. Bradbury and Hirsch's "Review of the Market for Sulphate of Ammonia" for the past year:—

Total production, 1892 . . . . . 149,850 tons
,, ,, 1897 . . . . . 202,000 ,,

being an increase of about 35 per cent. in five years. The price of sulphate has increased from £7 10s. per ton in June last, to £10 per ton at the present time. If the present large increase in the production of sulphate continues, it will be necessary to find fresh outlets for its consumption. An Association has been formed to bring the great value of sulphate of ammonia before the public, and also to increase its demand and uses. It is advisable that all gas concerns should join the Association, and do everything in their power to increase the demand for sulphate. A larger demand will strengthen the price of ammonia compounds, and benefit all gas producers, whether they distil or sell ammoniacal liquor. In many towns the manner in which the effluents from the sulphate still are disposed of will require to be changed. Mr. J. F. Bell, of Stafford, proposed to settle the effluent liquor in a tank, and use it for quenching coke, washing gas, &c.; but he has not yet been able to carry out the work. On our visit to the Nottingham works, Mr. Chester pointed out that all the effluent was evaporated to dryness in a boiler.

Owing to the great fall in the price of tar products in 1892, the purchaser of the Warrington tar was unable to carry out his agreement; and the Corporation were thus compelled to enter into fresh arrangements for the disposal of their surplus tar. The difficulty of selling it at what they considered a fair price induced them to put down a tar distilling plant. This cost them rather more than £1000. The still and other plant were designed to distil a charge of 10 tons in one day. The plant has worked well since it was laid down in 1893; the following table showing the results:—

Year.	Coal Carbonized. Tons.	Tar Realized.	Revenue from Tar Per Ton of Coal Carbonized.
1893-4	21,000	£1651	1s. 6·8d.
1894-5	23,061	2641	2 3·4
1895-6	24,933	2269	1 9·8
1896-7	26,641	2297	1 8·6

Of the legislation of the past year, the only Act which affects gas managers is the Workmen's Compensation Act, 1897. To them, as to all employers of labour, it is of the utmost importance. This Act, which applies to all "factories" within the meaning of the Factories and Workshops Acts, 1878 to 1891, almost unrestrictedly fixes the employer with liability to pay compensation to a workman personally injured, or to the "dependents" of a workman killed by accident, arising out of, and in the course of, his employment. The restrictions are, that the employer is not liable for any injury (1) not disabling the workman for at least two weeks from earning full wages; or (2) attributable to the serious and wilful misconduct of the workman. There are also restrictions as to amount; the workman being only entitled to receive in case of injury, where total or partial incapacity for work results from the injury, a weekly payment during the incapacity after the second week not exceeding 50 per cent. of his weekly earnings during the previous twelve months, if he has been so long employed; but if not, then for any less period during which he has been in the occupation of the same employer—such weekly payment not to exceed £1. In case of death, the compensation to the "dependents" may reach the sum of £300, but cannot exceed it. Where any weekly payment has been continued for not less than six months, the liability therefor may, on application by the employer, be redeemed by the payment of a lump sum; and if this sum cannot be agreed upon, it is to be settled by arbitration. In cases of total incapacity, therefore, there is no limit as to the amount of compensation which may have to be paid; and the Act does not give any basis from which it might be calculated. "Contracting out" of the new Act is only allowed upon a certificate by the Registrar of Friendly Societies, to whom the terms of the proposed contract will have to be submitted, that he has inspected and approved an arrangement of insurance between the employer and workman contracting out. It is otherwise absolutely prohibited. The Act comes into operation on July 1 next. I think it will be found that matters will work much better and smoother for us under the Act, if a system of insurance can be arranged with the workmen, and the sanction of the Registrar of Friendly Societies obtained; but I commend this to your careful consideration.

The electric light is coming into more general use, as shown in the following table:—

Year.	Number of Companies.	Total Capital.	Number of Municipal Undertakings.	Loans Authorized.	Board of Trade Units Sold.
1895	38	£5,831,073	33	£1,967,000	30,203,766
1896	58	6,647,792	57	3,509,317	43,303,176

During the past year, 8 Electric Lighting Provisional Orders have been obtained by companies, and 42 by municipal bodies. Garcke's "Manual of Electric Undertakings" states that the cost of producing and distributing the electric current has fallen

from 4·07d. in 1895 to 3·37d. in 1896, exclusive of capital charges. Taking gas of 18½-candle power at 2s. 10d. per 1000 cubic feet, and reckoning that 4 watts of electric current give 1-candle power, it would require electricity to be sold at 2·3d. per unit to give the same amount of light for the same cost.

As acetylene gas gives such a beautiful light, and so many patents have been taken out for its production (as many as 119 during the past year), I obtained the following information from Messrs. Thorp and Marsh, of Manchester, who have been experimenting with the gas for the last eighteen months, with a view to its introduction for general lighting. The gas is produced by mixing carbide of calcium and water. The present selling price of carbide in large quantities is £16 per ton. One pound of carbide is guaranteed to yield 5 cubic

Number of Town.	Number of Years System in Use.	Meters in Use.			Cost of Inspection and Collecting Coin per Meter per Annum.	Charges to Ordinary Consumers for					Average Consumption per Meter.	Number of Cubic Feet for One Penny.	Rate per 1000 Cubic Feet.	Extra Charge for Coin Meters.	What Supplied to Users of Coin Meter Free. S = Service. M = Meter Fixing. P = Pipes and Fittings. B = Boiling Burner.	Total Consumption Due to Coin Meters.
						Gas Lighting Only.	Meter Rent.		Fixing.							
		Wet.	Dry.	Total.			2-Lt.	3-Lt.	Meter.	Service Number of Yards Free.						
					d.	s. d.	s. d.	s. d.	s. d.				s. d.	d.		Thousands.
1	4½	..	120	120	16·0	3 0	3 0	4 0	Nil	10	11,000	25	3 4	4	S.M.P.	1,320
2	5	153	100	253	5·6	3 11	2 4	3 0	Nil	All	6 000	17	4 10	11	S.M.P.B.	1,518
3	4	649	1	650	11·0	3 0	2 0	3 0	Nil	All	3 869	23	3 7	7	S.M.	2,514
4	1½	⅛	⅛	..	..	2 11	Nil	Nil	Nil	All	15,000	25	3 4	5	S.M.P.B.	3,000
5	3	..	300	300	32·0	2 6	4 0	4 0	2 6	10	10,000	25	3 4	10	S.M.P.B.	..
6	..	400	..	400	..	2 9	2 0	3 0	..	50	..	25	3 4	7	Nil	..
7	5	..	36	36	8·0	3 9	3 0	4 0	Nil	All	5,000	20	4 2	5	S.M.	180
8	¼	..	30	30	12·0	2 7	4 0	4 0	..	10	7,000	28	3 0	5	S.M.	210
9	1	..	100	100	14·4	2 7	3 0	3 0	Nil	15	4,500	25	3 4	9	S.M.	450
10	2	..	1000	1,000	..	2 9	Nil	Nil	..	..	6,600	25	3 4	7	M.	6,600
11	⅛	10	10	20	..	3 0	2 0	2 0	Nil	All	..	24	3 5	5	S.M.P.B.	..
12	3	..	80	80	..	4 2	2 0	3 0	Nil	All	6,222	17	4 10	8	S.M.P.	497
13	3	24	60	84	15·4	3 6	2 0	3 0	..	10	4,550	20	4 2	8	S.M.P.B.	382
14	2	150	..	150	15·0	2 10	1 0	1 0	Nil	All	6,000	22	3 9	11	S.M.	900
15	2	..	96	96	18·0	3 2	Nil	Nil	Nil	All	12,000	25	3 4	2	S.M.	1,152
16	1	..	212	212	..	2 7	2 6	3 0	Nil	All	6,800	25	3 4	9	S.M.	144
17	7	..	..	14,776	..	2 9	2 8	2 8	..	..	8,000	25	3 4	7	S.M.P.B.	118,208
18	2	..	60	60	..	3 4	2 0	2 0	Nil	4	5,700	20	4 2	10	S.M.	342
19	3	..	1700	1,700	6·6	2 6	2 6	3 0	Nil	All	7,000	25	3 4	10	S.M.	11,900
20	2	600	..	600	12·0	3 0	1 8	2 0	3 6	5s.	13,800	23	3 7	7	S.M.P.B.	8,280
21	2½	130	70	200	27·6	2 8	1 8	2 0	Nil	All	7,000	25	3 4	8	S.M.P.	1,400
22	2½	..	500	500	..	2 4	Nil	Nil	Nil	10	12,600	25	3 4	12	S.M.P.B.	6,300
23	3½	2682	..	2,682	15·5	1 8	1 4	2 4	Nil	10	8,500	33	2 6	10	S.M.P.B.	22,797
24	..	12	12	24	..	3 7	..	..	..	..	7,000	20	4 2	7	S.M.	168
25	3	..	6	6	..	2 11	..	..	..	..	8,000	25	3 4	5	..	48
26	3½	100	750	850	7·6	2 5	2 4	2 10	Nil	10	8,600	28	3 0	7	S.M.	731
27	5	..	1100	1,100	12·5	2 6	1 0	..	Nil	All	7,200	27	3 1	7	S.M.P.B.	7,920
28	2	6	326	332	6·7	2 10	2 0	3 0	Nil	All	8,633	24	3 5	7	S.M.P.B.	2,866
29	2½	10	64	74	6·4	3 9	3 0	4 0	Nil	Nil	5,000	20	4 2	5	M.	370
30	6	..	634	634	11·3	3 0	2 8	2 8	Nil	All	10,200	22	3 9	9	S.M.B.	6,466
31	5	2800	..	2,800	..	2 6	Nil	Nil	Nil	All	10,000	30	2 9	3	S.M.P.B.	28,000
32	½	..	550	550	..	4 2	4 0	4 0	Nil	Nil	..	18	4 7	5	S.M.P.B.	..
33	1½	..	730	730	..	2 10	2 0	..	..	..	6,000	25	3 4	6	..	4,380
34	1	..	1100	1,100	15·6	2 8	1 6	2 0	..	Nil	8,000	25	3 4	8	M.P.B.	8,800
35	3	172	10	182	..	3 9	2 6	3 4	..	Nil	5,000	20	4 2	5	S.M.P.B.	910
36	3	134	266	400	..	2 5	2 0	2 6	Nil	All	7,500	28½	2 11	6	S.M.P.B.	3,000
37	1½	..	6	6	..	4 4	Nil	Nil	..	7	..	15	5 1	9	S.M.	..
38	2	600	..	600	..	2 3	Nil	Nil	Nil	All	8,000	27	3 1	10	S.M.P.B.	4,800
39	2	..	158	158	14·2	3 11	2 0	2 6	5 0	All	7,000	20	4 2	3	S.M.P.	1,116
40	7	..	5000	5,000	..	2 6	2 4	2 8	Nil	All	10,000	25	3 4	10	S.M.	50,000
41	2	..	240	240	..	3 11	2 0	3 0	..	..	6,500	15	5 0	13	S.M.P.B.	1,560
42	4	..	900	900	..	2 10	1 0	1 0	..	Nil	..	25	3 4	6	S.M.P.B.	..
43	½	..	103	103	23·3	2 10	2 0	2 0	3 6	Nil	7,400	23	3 7	9	S.M.B.	762
44	3½	900	300	1,200	..	2 4	Nil	Nil	Nil	All	12,000	28	3 0	8	S.M.	14,400
45	2	60	..	60	..	2 11	2 0	3 0	Nil	All	2,000	22½	3 8	9	S.M.B.	120
46	1	..	70	70	..	2 0	2 0	2 8	Nil	All	8,229	30	2 9	9	S.M.P.B.	576
47	2	220	..	220	..	2 3	2 0	2 8	Nil	All	6,000	25	3 4	11	S.M.	1,320
48	4	..	300	300	12·8	3 0	Nil	Nil	Nil	12	8,300	25	3 4	4	S.M.	2,490
49	3	..	90	90	..	3 6	1 4	2 0	Nil	Nil	9,450	22½	3 8	2	S.M.	850
50	5½	..	54	54	..	3 2	3 4	5 0	..	Nil	8,000	20	4 2	12	M.	432
51	3½	350	150	500	..	2 11	Nil	Nil	Nil	All	8,500	27	3 1	2	S.M.P.	4,250
52	4½	..	22	22	..	4 0	2 8	3 4	..	Nil	11,500	18	4 7	7	M.	253
53	3	..	1300	1,300	10·4	3 0	4 0	5 0	Nil	All	14,000	22	3 9	9	S.M.P.B.	18,200
54	1½	..	1650	1,650	15·4	2 1	..	3 0	Nil	All	10,500	27	3 1	12	S.M.P.B.	17,325
55	1	..	100	100	3·6	3 9	3 0	4 0	..	Nil	9,000	20	4 2	14	S.M.B.	900
56	5	75	300	375	..	2 9	3 0	3 0	Nil	All	11,000	24	3 5	8	S.M.P.B.	9,125
57	2	..	350	350	13·7	2 8	Nil	Nil	Nil	All	6,400	28	3 0	4	S.M.	2,240
58	2½	..	230	230	..	3 0	2 4	2 4	..	..	..	22	3 9	4	S.M.	..
59	4	..	406	406	..	3 10	2 4	3 4	..	All	6,000	20	4 2	4	S.M.	2,436
60	2	..	102	102	..	2 11	3 0	3 0	Nil	12	6,000	25	3 4	5	S.M.	612
61	7	36	63	99	..	3 7	4 0	4 0	5 0	All	..	19	4 3	8	S.M.P.B.	..
62	3	..	2400	2,400	..	2 8	Nil	Nil	Nil	All	8,650	24	3 5	9	S.M.P.B.	20,760
63	2	..	600	600	5·0	2 11	..	2 0	Nil	All	8,500	25	3 4	5	S.M.P.B.	5,100
64	3	150	58	208	5·5	3 0	Nil	Nil	Nil	All	6,000	22½	3 8	8	S.M.P.B.	1,248
65	4	10	288	298	12·7	3 4	3 0	3 0	Nil	..	7,320	22	3 9	5	B.	2,181
66	3	..	700	700	..	3 0	Nil	Nil	Nil	All	6,750	25	3 4	4	S.M.P.	4,725
67	5	..	..	13,959	50·0	2 3	Nil	Nil	Nil	All	8,000	25	3 4	13	S.M.P.B.	111,672
68	3	..	900	900	..	2 2	4 0	5 0	..	Nil	10,062	28	3 0	10	S.M.P.B.	9,055
69	5	..	203	203	11·6	3 6	2 0	3 0	Nil	Nil	9,000	22	3 9	3	M.B.	1,827
70	5	136	103	239	15·4	3 0	1 4	1 8	Nil	All	4,981	21	3 11	11	S.M.	1,190
71	4	161	265	426	9·0	2 3	2 0	3 0	..	..	4,000	25	3 4	13	S.M.B.P.	1,704
72	6	..	370	370	..	5 2	Nil	Nil	..	All	9,500	22½	3 8	6	S.M.B.	3,515
73	4½	198	103	301	..	3 4	2 0	2 8	Nil	10	7,500	22	3 9	5	S.M.	2,257
74	5	..	2000	2,000	..	2 3	2 0	2 0	..	Nil	13,000	28	3 0	9	S.	26,000
75	4½	883	48	931	13·75	3 8	2 0	2 0	Nil	Nil	6,500	20	4 2	6	M.	6,051
76	7	503	1044	1,547	8·0	3 3	2 0	2 8	..	Nil	4,000	20	4 2	11	S.M.P.B.	6,188
77	1	..	50	50	..	3 3	1 6	2 0	Nil	All	6,014	21	3 11	8	S.M.	300
78	4	..	..	1,064	6·8	2 9	Nil	Nil	..	Nil	10,800	25	3 4	7	S.M.P.B.	11,491
79	3	2950	50	3,000	27·0	2 10	3 0	3 0	..	Nil	8,600	23	3 7	9	S.M.P.B.	25,800
80	4½	..	1800	1,800	20·0	2 6	3 0	3 0	Nil	All	10,000	22	3 10	16	S.M.P.B.	18,000

Remarks.

In the cases of Nos. 6 and 24, the system has only just been started.

In replying to the question: "Are you quite satisfied the system pays?" Nos. 9, 16, 25, 39, and 71 are doubtful; while Nos. 29, 37, 45, and 57 state it does not pay. The remainder are quite satisfied.

In replying to the question: "What have the meters cost for repairs?" most managers state that the meters are still under the five years' guarantee; and no expense has been incurred beyond the cost of removal and returning defective meters to makers.

Thirteen report a slight loss through money being short in the boxes.

In reply to the question: "What have the meters cost for inspection and collecting coin?" Nos. 18, 38, 40, 42, 45, 47, 49, 51, 58, 59, 60, 61, and 73 reply: "Same as ordinary meters;" No. 22 says two or three times, No. 31 twice, and No. 62 four times the cost of ordinary inspection.

Nos. 32, 52, and 72 allow from 2 to 4 cubic feet per penny extra if the gas is consumed for heating or cooking. Nos. 19, 61, 71, and 79 allow from 3 to 5 cubic feet extra per penny if the consumer supplies the pipes and fitting. Nos. 9, 27, 44, 46, and 79 charge an extra price beyond the boundary. Nos. 34 and 41 are changing the price; giving 5 cubic feet more gas per penny. No. 58 gives from 22 to 25 cubic feet according to consumption.

The total consumption due to coin meters (as shown by the last column of the above table) is 644,584,000 cubic feet.

feet of gas having an illuminating power of 240 candles. The general method of producing gas is by adding water to carbide, which Messrs. Thorp and Marsh found both dangerous and unsatisfactory. They have therefore adopted a system of adding the carbide to the water. They state that the gas in its pure state, when burned, gradually chokes up the burners; and they have patented an arrangement for adding two volumes of air to one volume of the gas, which they find satisfactory to burn in ordinary coal-gas burners. I may say that the same firm have patented a safety-valve. They claim for this valve (which applies to acetylene or coal gas) that in cases where the light which has been left to burn all night has been extinguished by a stoppage of the supply of gas, the valve, which works automatically, will close and prevent any escape of gas on resuming the supply.

The consumption of gas has been greatly increased by the introduction of coin meters among the working class, who previously had rarely burned gas, and who, but for the introduction of this class of meter, never would have done so. To people of this class, a supply of gas by coin meters is a great boon, and much appreciated. It is very much safer than lighting by oil, which it is rapidly superseding; and the cost in most cases is less. The extra cost of supplying gas by coin meters has not yet been determined in many towns with any degree of accuracy, as the system has not been established sufficiently long to obtain reliable information. From the table on the preceding page, great differences are shown in the cost of using coin meters, upon which I considered it advisable to obtain information.

In Warrington, the coin meters, fittings, boiling-burners, and pipes, including labour in fixing same to the 2500 meters which were in operation on March 31 last, cost the Corporation rather over £6000. The cost of collecting the coins and reading the indices, but excluding watering, came to 1s. per meter. Taking a large number of meters which had been working twelve months, the average consumption was 8000 cubic feet. In the case of 790 meters, the house pipes, fittings, and all cost, was borne by the Corporation; and the meters fixed are set to supply 23 cubic feet for a penny, or an extra charge of 9½d. per 1000 cubic feet on the price of gas to ordinary consumers. Then 1710 meters are fixed in houses already supplied with internal pipes and fittings. The meters in this case are set to supply 25 cubic feet for a penny, or an extra charge of 6d. per 1000 cubic feet. Taking the meters as consuming 8000 cubic feet each per annum, the extra income from these 2500 meters—viz., 790 at 6s. 4d., and 1710 at 4s. each—should yield £592. Deducting from £6000 the cost of 2500 ordinary 3-light meters, we obtain £3683 as the extra cost of the coin-meter system. Allowing one-fifteenth for redemption of the debt, there remains £347—a sum not more than sufficient to pay for the extra cost of collecting the coins, interest on the outlay, and to meet the probable cost of repairs on the expiration of the makers' guarantee.

Before concluding my address, I wish to express my thanks to various members for the many kind wishes and the valuable information which they have so willingly supplied, but which time has prevented me from acknowledging individually.

Mr. Ritson, in proposing a vote of thanks to the President, said when he first heard that Mr. Haddock was to be their President, he expected to hear a very fine address; and in this expectation he had not been disappointed. They must all appreciate the versatile manner in which he had gone over matters connected with the gas industry. Mr. Haddock's association with Mr. Paterson had given him a very wide experience in coal matters; and he (Mr. Ritson) for one was glad he had brought forward the question that day in so lucid a manner.

Mr. Veevers seconded the motion; remarking that the fact that Mr. Haddock now occupied the very position at Warrington which he himself filled forty years ago gave him peculiar pleasure in doing so.

Mr. Isaac Carr said he wished to add a word of thanks to Mr. Haddock for his very excellent address. He felt a sort of personal responsibility for Mr. Haddock occupying the position he did that day. If it had not been for the pressure that he (Mr. Carr) brought to bear upon him in the initial stages, Mr. Haddock would certainly not have taken office. He felt that Mr. Haddock could do the work in a most excellent manner; and the address they had just listened to was a justification of the position he (Mr. Carr) had then taken up. There was much that was of interest in the address; and it would be read with advantage by those who were unfortunately absent.

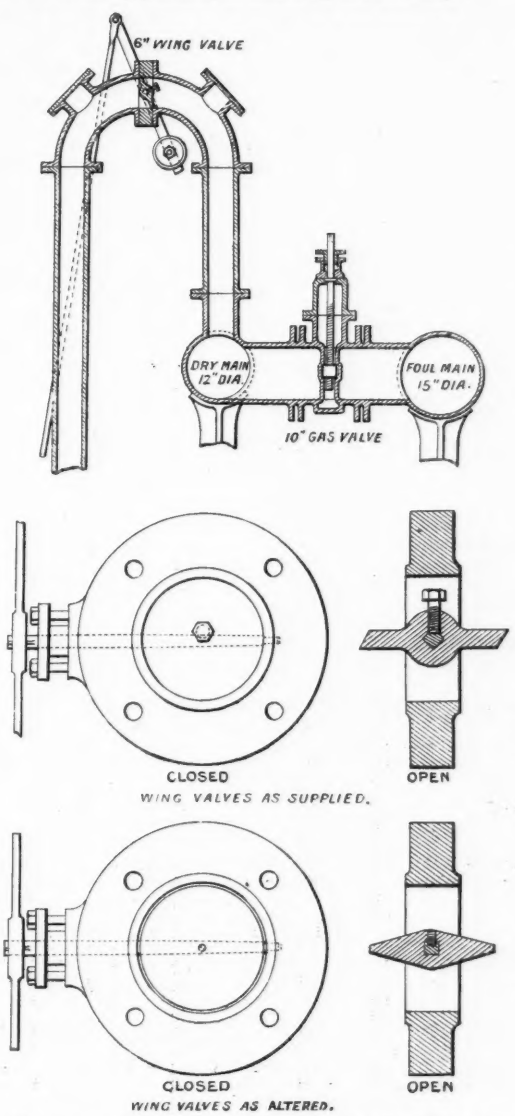
The resolution was passed unanimously.

Mr. H. Kendrick, of Stretford, read a paper entitled

AN EXPERIENCE WITH DRY MAINS.

The question of which is the most economical to use in the retort-house, wet or dry mains, is one that has agitated the gas world for a long time, in however only a minor degree; and it is with the object of endeavouring to bring the subject to a head, and obtain all the opinions possible, that I have brought the matter before you to-day. My experience as a manager of a gas-works has been very short compared with most of those to whom I am speaking; and I hope that this endeavour will not meet with any disfavour in consequence. Before I entered upon my duties at Stretford, I had no practical experience of dry mains, although I had theoretically a fair knowledge of the type which I found in course of erection when I first took charge of the gas-works.

A description of the plant will not be out of place here. The ovens each contain eight through ⌂ retorts, 22 in. by 16 in., set over Klönne regenerators and producers. The mouthpieces have self-sealing lids; and the ascension-pipes are 6 inches, tapering to 5 inches in diameter. The arch-pipes are 5 inches in diameter, enlarged to 6 inches in the centre, where the valve is inserted; and they are connected to the receiving main by 5-inch pipes. The receiving main is 12 inches in diameter; separate ones being provided for each oven. The gas passes away to the foul main through a 10-inch connection and valve; the foul main being 15 inches in diameter, and serving eight ovens. The two foul mains are connected to an 18-inch main at the end of the retort-stack and to the condensers, the inlet and outlet of which are 18 inches in diameter. The wing valves, which are 6 inches in diameter, are worked from the stage-floor by a long lever; being closed by lifting up the rod, when the retort-lid is opened, and opened by drawing down the rod after charging—thus making a clear way for the gas. The lever rods are provided with a hook, for fastening them to the cross-bars of the mouthpieces, to keep the valves open, as the valve-levers are counterbalanced to ensure them keeping the valves closed when the lever-rods are released. The wing-valves are of the ordinary pattern, as shown by the drawing.



Dry Mains and Wing Valves for Retort-Settings at the Stretford Gas-Works.

The whole of the brick and iron work was given into the hands of one contractor, who sublet the ironwork. The order was unfortunately placed very late in the season, so that we were not able to put the ovens to work until the beginning of December. Two were then started, under the supervision of the contractor's foreman, who remained a fortnight at the works to instruct the men and see that all things worked satisfactorily. We started with 2½-cwt. charges per mouthpiece every four hours; but after four days we were so troubled with stopped pipes that we had to alter the weight to 3 cwt. per mouthpiece, drawing and charging them five times in the 24 hours. This alteration reduced the number of stoppages very considerably;

but then another difficulty arose. The wing-valves became fast; and in endeavouring to loosen them by the levers, we broke the valve-spindles. We then had to prop open the valves until we could take them out and put in new spindles. When a valve had to be propped open, the gas always worked back from the receiving main, down the ascension-pipe, into any retort that was being drawn and charged, as we found it necessary to work with 2-10ths or 3-10ths back-pressure in order to keep up the illuminating power. I have often seen retorts so full of gas that it has been impossible for the stokers to see how to put in the first shovelful of coal; and as the valve-spindles were constantly breaking, the loss of gas was a frequent occurrence. Upon examining the wing-valves, I found that when new they were practically air-tight, and in addition were so thick and clumsy across the centre as to form a very considerable obstruction to the passage of the tar-laden gas; and besides this, the valves were fastened to the spindles by a set-screw, which projected considerably above the body of the valve. At my suggestion, the Contractor provided new wings of a much lighter pattern, which were fastened to the spindle with a grub-screw (as shown by the drawing), and not so good a fit as the first; $\frac{1}{16}$ inch play being left all round. There was now considerable relief, the valves not becoming fast so often; but we were never free from the nuisance of the gas working back down the ascension-pipes. On the evening of the 22nd of December, we noticed that the gas seemed to have great difficulty in passing up the ascension-pipes; and on examining the receiving mains, we found there was a considerable accumulation of pitch, but apparently not so much as to give any reason for alarm. By the morning, however, we found that the tar and liquor from the mains above had been blown over the arch-pipes into the retort mouthpieces; and the coal, for about 4 feet in the retorts, was drawn out as raw as when it had been put in five hours previously. By midday we had to shut off the ovens altogether, as we found that the 10-inch gas-valves were practically blocked with pitch. We fortunately had a good stock of gas, and the weather remained favourable; so that we were just enabled to pull through, by the time we had got two more ovens ready for work.

When we took out the 10-inch gas-valves on the four sections, we found that they, as well as the receiving mains, were completely blocked with hard pitch, and that a considerable quantity had found its way into the foul main. Thinking that a good deal of the trouble might have arisen through the high heats of the first few days, we cleaned all out thoroughly, and put them to work again. But they were as bad as ever in less than a month; and this was repeated a third time. In the meanwhile, we had substituted steel for wrought-iron spindles in the wing-valves; but this alteration made no permanent improvement. They did not break so often, certainly; but it was a regular thing to have to change two valves every day, on account of the broken spindles. The above method of cleaning the dry mains of thick tar and pitch was very expensive; so I had a 6-inch hole cut in the back of the foul main, opposite each valve, through which the valves and 10-inch connecting-pipes were scraped out every alternate day. This, however, was not sufficient; and during the remainder of the time they were working, the valves were cleared every twelve hours. Often a bucketful of thick tar and pitch would be taken out of each valve. We worked the ovens in this manner until the following autumn, when my Directors decided to substitute wet mains for the dry ones; and although we are now working with higher heats than formerly, we are obtaining better results without any of the trouble.

I have given the question of the stoppages a good deal of thought, in order to arrive at the cause. I did not consider that our heats were excessive, as lowering them made no improvement. The coals we used were principally from the Wigan district, with an admixture of 47 per cent. of second-class cannels, mostly from the same fields. This large proportion is necessary, as we supply 19-candle gas and only use oxide of iron in our purifiers; our standard burner for testing the gas being the No. 1 London argand (16-candle burner). The gas is therefore comparatively rich, and yields a large quantity of tar—viz., 15·46 gallons per ton of coal; and it is to this circumstance that I attribute the bulk of our misfortunes. I have made an attempt to support my theory by obtaining evidence from other gas-works, with a certain amount of success; and I here express my grateful thanks to those brother engineers who have so readily given the information asked for, and which I have here tabulated.

It will be seen from the table that the dry-main plants are practically the same in all the cases, and that the wet-main plants differ only in respect to the dip-pipes and flushing arrangements. There is considerable variation in the sources of the coal supply; and in no case do they agree with the Stretford district. The percentages of cannels used can be practically ignored with the exception of the gas-works "F;" and there wet mains are in use. The yield of gas per ton, with one exception, in each system is practically identical; while the illuminating power of the gas supplied is in each instance considerably below the Stretford standard. Those most nearly approaching it are the gas-works "E" and "F," where wet mains are in use. It will also be noticed that the yield of tar per ton varies with the quality of the gas supplied. From the foregoing particulars, I claim a very clear argument in favour of my theory, that the poorer the gas the less is the quantity of tar to be deposited on

Gas-Works.	Mains in Use	Dips, Anti-Dips, or Valves.	Furnace.	Size of Retort and Number in Ovens.	Diameter of Ascension and Arch Pipes.	Size of Hydraulic or Dry Main.	Tar Overflows or Flushing Pipes.	Do the mains and gas-valves become pitched up?	Place whence Coal was Obtained.	Percentage of Cannel Used.	Yield of Gas per Ton.	Illuminating Power of Gas Supplied.	Tar per Ton of Coal.	Does the gas work back down the ascension-pipes?
											Cub. Ft.	Candles.	Gallons.	
A	Dry.	6-in. wing valves.	Klönne.	22 in. × 16 in. 8 retorts.	6 in. to 5 in. 5 inches.	12 in. dia.	None.	Only when working with high heats.	Lancashire. Derbyshire. North Wales.	1·00	10,600	15·50	10·20	When working with back-pressure.
B	,,	,,	,,	,,	,,	14 in. ,,	,,	Not during the last 12 months.	South Yorkshire and Durham.	1·28	10,816	17·39	12·28	No.
C	,,	5-in. ,,	,,	,,	,,	14 in. ,,	,,	No.	Lancashire. Derbyshire. North Stafford. North Wales.	3·50	10,800	16·50 to 16·75	11·00	,,
D	,,	,,	,,	,,	,,	14 in. × 16 in.	,,	Occasionally.	Derbyshire. North Wales.	None.	11,500	15	13·00	,,
Stretford	,,	6-in. ,,	,,	,,	,,	12 in. dia.	,,	Yes; about every four weeks.	Wigan district.	47·27 All bastard.	10,647	18·97	15·46	Yes.
E	Wet.	Anti-Dips.	Klönne.	22 in. × 16 in. 8 retorts.	6 in. to 5 in. 5 inches.	24 in. × 25½ in.	Both.	No.	Burnley district.	None. Maxim carburetter 10 and Maxim carburetter.	11,300	17·50	14·00	No.
F	,,	,,	Generator.	20 in. × 15 in. 7 and 8 retorts.	,,	17 in. × 20 in.	Tar overflows only.	Occasionally.	Wakefield district.	30·51 Half best. Half bastard.	10,300	17 to 18	13·00	Sometimes
Stretford	,,	Dips.	Klönne.	22 in. × 16 in. 8 retorts.	,,	21 in. × 24 in.	Both.	No.	Wigan district South Yorkshire.		11,275	18·89	15·94	No.

the valves and spindles and in the dry main; therefore there is not so much likelihood of stoppages from that cause. Then the yields per ton of gas-works "A," "B," and "C" are practically the same as those obtained by myself with dry mains; thus proving that the heats of the retorts at Stretford were not excessive, as is also borne out by the much better yields per ton obtained during the past half year. The difference in the sizes of the receiving or dry mains is, I am afraid, a factor in the cause of the stoppages; and this is borne out to a certain extent by the experience at gas-works "A," where stoppages occur when the heats are high.

There are certain reasons that make it injudicious on my part to pass a wholesale condemnation on the system: First, the system, with slight modifications, is in successful operation in other gas-works, where the conditions are rather different from those in existence at Stretford. Secondly, the character of the coals and cannels carbonized is not the same. Thirdly, the percentage of cannel used is more, and the illuminating power higher; the gas probably being richer than actually represented by the figures, owing to the absence of lime purification. Lastly, the large yield of tar per ton will make the foul gas more difficult to deal with when working with tight-fitting valves, spindles, and stuffing-boxes, and a smaller receiving main than is in use with poorer gas. I am therefore of opinion that dry mains worked with wing-valves as described in the earlier part of this paper, are not suitable plant for the manufacture of a rich or comparatively rich gas, whatever they may be for the poorer gases supplied by Midland and Southern works.

The system in use at gas-works "E" combines the advantages of both wet and dry mains. The dip-pipes and hydraulic main are of the ordinary pattern, with the addition of a slide-valve made in the side of each dip-pipe, above the level of the seal. This slide-valve is worked by a rod passing through a stuffing-box in the hydraulic main cover, and a lever and rod from the stage floor, as is the case with dry mains. The wet main, combined with the flushing arrangement, entirely prevents the formation of pitch in the hydraulic main; and when the slide-valve is closed, it cuts off the face of the seating any thick tar which may be deposited there, and working in wedge-shaped guides always makes a tight joint, so that it is practically impossible for gas to escape down the ascension-pipes when the retorts are opened.

At gas-works "F" another system is in use, and the following is a description by the Engineer of the works:—

> The principal factor in the arrangement is the slide-valve, which is opened and closed by means of a lever and chain extending to the retort mouthpieces. When the retort is charged and closed, the slide-valve is opened by means of the chain; and the gas is thus allowed to go forward into the foul main without coming into contact with the liquid seal in the hydraulic main. A dip-pipe, however, is provided altogether apart from the slide-valve (though close to it); and, if necessary, the gas can be carried away by the usual dip arrangement, in which case the slide-valve will be closed. When the retort is being charged, the slide-valve is closed. Occasionally, during the operation of charging, gas (if working with back-pressure) comes down the ascension-pipe; the cause presumably being that the slide-valve does not shut off perfectly tight. We work as near as possible with a level gauge; and the dip-pipes have about 2 inches of seal. We are a little troubled with stoppages in the last condenser of a series of four, and find the cause to be the deposition of fine ashes. These apparently are carried forward through the anti-dips with the tarry vapour, and accumulate at the point named. With us, in this respect, the anti-dips are disadvantageous, for I believe that the fine ashes would, with a liquid seal, be arrested in the hydraulic main, and be carried away with the other residuals condensing therein.

The supporters of the dry-main systems claim certain advantages by the use of their particular plants. First, the cost of the installation is less than with wet mains; secondly, more gas per ton of coal is obtained, and as the exhausters can be worked at level gauge, there will be no back-pressure in the retorts, and consequently no leakage of gas into the setting; thirdly, there is little or no carbon deposited in the retorts, and consequently no extra fuel is required in burning off the charges, and the retorts last longer, as they are not damaged so often by de-scurfing. In anti-dip systems, with a wet main, the cost of the installation will be more than that with wet mains and dip-pipes; but the second and third claims are put forward as applying to those systems as well as to the former.

I am prepared to admit that the first claim will have to be allowed. The cost for dry mains should be less than for wet mains, when provided with flushing-pipes, tar overflows, and weir-valves; but allowance must be made for the expensive wing-valves, levers, and rods, and the additional lengths of the ascension-pipes, which will bring down the extra cost of the wet mains to about £13 per single oven—a not very large amount, when it is remembered that the users of dry mains say that they clean out the accumulation of pitch every summer, the cost of which, in my experience, is quite equal to the interest upon the extra outlay. Secondly, I am not prepared to admit that any great gain results from the use of dry mains or anti-dips. If there is more gas produced per ton, the illuminating power will be lower, and cannel or other enriching material must be used in order to make good the deficiency. Where a low-grade gas is supplied, this, of course, is not so important as with a high-grade gas. It is a well-known fact that fire-clay retorts are more or less porous, and that a light gas, such as hydrogen or methane, passes through a porous medium much quicker than a heavy gas, such as ethane or the higher hydrocarbons; so that when dips are in use, the slight back-pressure results in a larger percentage of the light gases passing into the setting through the pores of the retorts, leaving the gas that passes up the ascension-pipes richer than is the case when anti-dips are used. When using dry mains, the make of gas per ton at Stretford was 10,647 cubic feet; but after the dry mains were replaced by wet, we obtained 10,874 cubic feet. The coals and cannels being the same in both cases, I attribute the increased yield to the absence of loss down the ascension-pipes, and the higher heats I was enabled to work at. Thirdly, there will be little or no deposit of carbon in the retorts when working with wet mains, if the seals are kept as light as is consistent with safe working, and the vacuum kept to within 2-10ths or less of the seals; so that the claim of less fuel and a longer life applies equally well to wet mains worked under the foregoing conditions.

When such results as I have been able to attain are within the reach of all, when working with wet mains and materials of the same quality, I should not be prepared to recommend anyone who has to produce gas of good quality to make use of dry mains, as, taking all things into consideration, I am of opinion that the disadvantages far outweigh any advantage that is claimed for them. This opinion is entirely based upon my own experience of the system, and is borne out to a certain extent, for similar reasons, by gentlemen I have consulted, who declare that they prefer wet mains to dry, but have to work with the plant they have at their respective works.

In conclusion, I hope that I have placed this question before you in a clear and interesting manner; my sole reason for bringing it forward being to gain more knowledge, which I am certain I shall do from the wider and more varied experience of members of this Association.

Discussion.

The PRESIDENT, in inviting discussion, asked those who had used dry mains to give their experience.

Mr. HARRISON VEEVERS said, after an experience of 18 years, he was perfectly satisfied with dry mains. If the discussion on this subject could be deferred to the next meeting, he should be happy to produce drawings of the apparatus he had used. The first experience he had had with dry mains had taught him a great deal. At that time he charged the retorts for six hours; but he very soon found that they got choked, and this caused him to ascertain how much gas he was getting between the fifth and sixth hours, so as to see whether it was worth while carbonizing for six hours. The conclusion he came to was that five hours were quite sufficient. He had been able to entirely obviate the stoppage of the valves, and had not for years had a valve that got choked with pitch.

The PRESIDENT asked if Mr. Veevers used winged valves.

Mr. VEEVERS said no; they were disc valves. This matter could be much better illustrated by diagrams than by any description that he could give. When he found that the valves were getting choked, he put a cistern on the top of the ascension-pipe; and the water which was condensed in the earlier part of the charge was evaporated in the latter part. His plan was different to the one shown in the paper. By his arrangement if there happened to be a block in the main, the gas was not stopped, but went into an ordinary hydraulic main. He wished to call attention to one thing that Mr. Kendrick had spoken about; and that was the formation of carbon in the retort. In his opinion, it was not the percolation of gas through the retort that caused it, so much as the breaking up of the hydrocarbons by the intense heat of the retort liberating the hydrogen in the carbon. If the matter should come up at the next meeting, he would be very glad to exhibit a cartoon showing the system which he had adopted, and with which he was very well satisfied.

Mr. J. H. BREARLEY (Longwood) could sympathize with Mr. Kendrick in the difficulties he had experieuced. His mains had not been so bad; he had a wet seal, coupled with a slide valve called "Meiklejohn's anti-dip." He would strongly advise those engineers who had not yet adopted the valve system, not to do it. At the same time, there was the advantage of getting the gas quickly away. There was not so much breaking up of the hydrocarbons in the retorts with the wing valves and the slide valves as with the seal. In the letter he had written to Mr. Kendrick, he referred to the trouble he had had with stoppage in the condensers. With the fourth condenser, he found once a month or six weeks a deposition of fine ashes in the bottom of the condenser, which, if it were not removed, would cause a stoppage. He had been knocked up at 5 o'clock in the morning that very week from this reason. As to the illuminating power, he did not see why that should suffer with the dry main if they had an exhauster well governed. He had obtained 17 to 17½ candle gas repeatedly from ordinary Yorkshire coal. Of course, it was a good quality of coal, but not cannel. He could quite imagine that they were troubled with stoppages in the wing valves; but he had experienced no stoppage with the slide valves, although possibly he would have done so if they were not cleaned out every summer. He should like to ask Mr. Kendrick the percentage of cannel he used, as he had not seen it stated in the paper.

Mr. KENDRICK replied that he used 47 per cent.

Mr. BREARLEY said that accounted for the extraordinarily large make. He did not see that there would be any difference in the make with wet mains and dry mains. It was purely a question which worked best with the least amount of trouble.

Mr. S. MERRELL asked Mr. Kendrick what weight of charge he was working with at the present time.

Mr. KENDRICK replied 3 cwt. per mouthpiece.

Mr. E. A. HARMAN (Huddersfield) said he listened with great interest to the paper. There were so many points in connection with the subject, running on similar lines to the hydraulic main, that it was impossible to keep them distinct. The President in his opening remarks said that those who had experience of dry mains should take part in the discussion; but his (Mr. Harman's) experience was very small in this direction. The placing of the throttle valves in any portion of the ascension-pipe—either in the arch or in the vertical pipe—seemed to his mind to be almost fatal to the satisfactory working of dry mains. They had sufficient difficulty with stopped pipes already; and placing an obstruction right in the centre of the pipe was certainly a very weak feature of the arrangement. The anti-dip system, which overcame the evil to a certain extent, could hardly be considered as having any connection with the dry main. With the anti-dip, there was liquid in the main for sealing the dip in. It seemed to him that the temperature of the dry main must be considerably higher than in the case of the hydraulic main. He did not know whether Mr. Kendrick could tell him what the temperature of the dry main at Stretford was when he was conducting his experiments. It also seemed to him that the hydraulic main assisted slightly in the matter of purification. The fact that the gas had to bubble through thin tar and ammoniacal liquor must cause a considerable amount of the impurities of the gas to be absorbed. He never made any experiments with the gas before and after it left the hydraulic main; but he had no doubt at all that a considerable amount of the impurities were really extracted in the hydraulic main itself. It seemed a most simple matter to experiment with a system of dry mains, if they felt so disposed. The only point was to be sure that they stopped up the ascension-pipe at the mouthpiece during the moment of charging and drawing—of course, taking all due precautions of emptying the hydraulic main previously, and having an independent exhaust governed down to at least 1-10th back-pressure. He had heard people who used dry mains speak very highly of them. One engineer had told him that he would certainly work with dry mains in preference to a hydraulic. This gentleman had told him that he had no difficulty in adjusting the seals, but had previously had great difficulty in adjusting the levels of the hydraulic main—not merely when he started to work, but after the retort-bench had heated up. In consequence of the expansion of the brickwork, the mains were thrown out of level both longitudinally and transversely; and hence his seals were most irregular. Then again this gentleman had mentioned that he had had the experience of a broken dip-pipe when using a hydraulic main. All these difficulties would be overcome by the adoption of dry mains. There were many other points of interest and importance in connection with the subject which he was sure they would do well to experiment with, either on a small or large scale. Where the hydraulic mains were (as they were at his own works) supported independently of the retort-bench by means of cross girders, the difficulty of obtaining level seals was not so great as it would otherwise be; but even then difficulties were experienced through the variations in the seals. Unless the seals were kept adjusted to an exact level, there was a danger of the gas momentarily going up the ascension-pipe on one side of the bench, instead of equalizing itself between the two benches. He had discovered this by putting his hand on the pipe at one side and finding it quite cool, while on the other side of the bench it was far too hot for the hand; and yet the seals had shown by the dipping to have been nearly alike. Such a sudden rush of gas on one side was necessarily liable to produce stopped pipes, and stopped pipes alone were such a bugbear in the working of the retort-house that anything that could be done to prevent them was well worth attention. Some one had said that he did not see how the make of gas was increased by the adoption of the hydraulic main; but it seemed to him (Mr. Harman) that there was great danger of the make of gas being increased too rapidly.

Mr. ISAAC CARR (Widnes) thought Mr. Kendrick had brought the subject before the meeting in a very profitable and interesting manner, and that he had made out a good case, and given very good reasons why they should adopt the wet main in preference to the dry. He (Mr. Carr) had not had any experience with dry mains other than in connection with the tar process that they used for increasing their illuminating power at Widnes. There, of course, they had a very powerful plug tap which certainly through its close proximity to the mouthpiece became stopped up at times; but it was so strong in its construction that it could not be injured. These taps had to be taken out occasionally to clear the pitch out of them; but in some retort-house extensions that he had been recently carrying out, he had adopted the wet-main principle. There was one point on which he should like to ask Mr. Kendrick a question; that was whether he was troubled with naphthalene at all, and if he was, whether the change from the wet to the dry main had had any effect on it. It had been represented to him that the danger of the naphthalene difficulty was greater with the wet main; and he should be glad to know if Mr. Kendrick could give him any information on this point. Mr. Harman had mentioned the peculiarity of the gas travelling up one side of the retort-house only when apparently, on measuring, the dip-seals on each side were as nearly the same as could possibly be; and he might say that he had experienced the same thing. With large retorts there was always this objection; even the direction of the wind he found was sufficient to divert the gas from one side to the other. The gas would take the warmest side; and whichever way a current of wind happened to strike a set of ascension pipes, was quite sufficient to make one side take all the draught. His only way of obviating this was to put a mid-feather in the centre of the retorts, and work each retort separately.

The PRESIDENT said he had had no experience with dry mains at Warrington. They at one time employed the anti-dip; but they had had so much trouble due to stoppages, that they gave them up. He had heard from Mr. Paterson that he had practically no trouble with his valves sticking; and, of course, it was a very great advantage if they could have a dip-valve that would not stick. Recently they had put up a wet main; they had all the pipes turned exactly; and yet when they tried to regulate the seal, some of the dip-pipes would blow back when the others were sealed. As far as they could tell, everything was perfectly level. But there was no doubt it was not possible to get the same amount of seal with a wet main as with throttle-valves. A great deal of trouble with throttle-valves was when used for exhausting. Mr. Paterson, at Cheltenham, exhausted with the Körting jet, and found it work successfully.

Mr. KENDRICK, in reply, said he had never worked with six-hour charges at all—his longest were 4 hours 48 minutes; and for four months out of the time that they had them in use, they worked the dry mains only. It was unfortunate for them that during a portion of the time they had both an old retort-house in which wet mains were fixed, and a new retort-house in which there were dry mains; and between the two they had to have a regulating valve. It was a case of having to have a man on the spindles all the time to keep the pressure right. With regard to the make of gas, he found it necessary always to work with 2-10ths or 3-10ths back-pressure, because if he did not do this the proportion of cannel used became a matter of alarm both to himself and his Directors. Coming next to the question of the breaking up of the hydrocarbons, the hydrocarbons would not break up unless the heats were very high; and as with gas made of a low temperature or a high temperature there would always be a certain proportion of hydrogen, and a certain proportion of the heavy hydrocarbons, of course in the richer gas there would be a greater proportion of the latter, so that he thought he was perfectly correct when he said that with back-pressure in the retort, the diffusion of gas itself through the porous material of the retort would be greater than when there was a slight pressure in the retort with a level gauge, or when working with a vacuum, as one gentleman with whom he had been in communication said he did. If one worked with a vacuum, some of the gas from the furnace would be drawn in, and thereby reduce the illuminating power of the gas. As to the cost of working, he might say that in 1896 their cost for coal only was 14d. per 1000 cubic feet of gas made—that was without taking anything off for residuals; and in 1897 it was 13d. although the prices which they paid for coal were rather heavier per ton in 1897 than in 1896. So that there was sufficient ground for saying that he obtained better results with the wet mains than with the dry. In reply to Mr. Harman, he could not give any particulars as to the actual temperature of the dry mains; but he did know the temperature of the condensers. The temperature of the inlet of the condenser working with a dry main averaged from 170° up to 180° Fahr.; in the corresponding period, with the wet main, the temperature was something like 30° or 40° lower. So that the very high temperature of the gas coming away when working with wing-valves and dry mains had a good deal to do with the pitching up of the apparatus. With regard to stopped pipes, he must say that with wet mains he had very little trouble indeed. Occasionally they had one or two a week. He told his stokers to try with the clearing-rod every time they opened a mouthpiece; and they generally found the obstruction was at the bottom, by the mouthpiece. They had not to leave off working a retort at all within the last month on account of a pipe being pitched up. They were not troubled with naphthalene at all in the district, and very little in the works. He must say that he did see more of it when working with dry mains than when working with the wet; but the difference was so slight as to be hardly worth mentioning at all. He could bear out what had been said with reference to the effect of the wind playing on the retorts. His own retorts were through retorts; and it was very often the case that the gas was passing up one side one day and up the other the next. In conclusion, he thanked the members for their kind attention to his paper.

Mr. H. TOWNSEND (of Wakefield) then read a paper entitled

EMERGENCIES.

Although the papers which have been read before this and kindred Societies have been so numerous, I do not remember any on the above subject, though I can conceive of no topic likely to lead to a better discussion, or one which should prove more useful to young managers of small gas-works, with whom emergencies are the most likely to occur, and who at such times have to rely almost entirely on their own resources. In the hope that the recital of my own experiences may induce other members of

the Institution to favour us with an account of theirs, I venture, with diffidence, to place it before you.

As it has been my lot to manage some gas-works which have been badly designed and constructed, and ill-equipped for the work they have had to do, they have naturally been fertile in emergencies. The first of any moment which occurred to me took place over twenty years ago, when I was in charge of a small works supplying two small towns with gas. The works were situated in one of these towns; and a quarter of a mile away was a gasholder, which was the only means of supplying the other town. On the same site were situated the offices of the company and two residences, one for the manager and the other for the foreman.

After I had been in charge of these works for a few months, one Saturday night in January, about nine o'clock, with a gale of wind blowing, accompanied by torrents of rain, while busily engaged wrestling with the balance-sheet, I was startled by hearing a most peculiar noise, which seemed to come from the gasholder. I ran round to see what was the matter, when I was thunderstruck to find the holder slowly turning over, and the columns and girders tumbling all over the place. I had instinctively grasped the key of one of the valves, and wondered what was the best thing to do. If the gas continued to leave the holder, probably it would collapse. There were no other means of keeping the town supplied with gas; and if the holder were wrecked, weeks would elapse before it could be again rendered serviceable. So, whatever the consequences, I thought I must do my level-best to try and save the bell from further damage. With this thought, I tried the inlet-valve, and found it closed. I opened it, and then grasped the key of the outlet-valve, which I shut. The effect was magical. Out went all the lamps; and people came streaming into the yard to see what was amiss. I soon found myself surrounded by a noisy excited crowd. Among them, however, were some of our own men, and a builder who lived opposite, and who proved very useful. He kindly offered me anything in his yard which might be of service.

Leaving the crowd in charge of the builder, I went round the holder to see the extent of the damage. I soon found a bad escape; gas was roaring out of a great hole in the side. I promptly decided that this hole must be got under water; so I went back to the builder, and he sent men across for some planks, as we found the bottom curb had got caught in the brickwork. When we got it clear, the holder sank till the great hole got below the water; and then we breathed more freely. At this point, I think I had better describe the holder. It was a second-hand affair, which the Company had picked up cheap, and was the flimsiest thing I ever saw. It worked in a brick tank which leaked by-the-bye; the water in it never being within 4 feet of the coping. It was only a single-lift holder, 80 feet in diameter; and the crown had no support whatever. It was not trussed; neither was there any timber framing in the tank. The bottom guide-rollers had also been dispensed with. The columns were small round cast-iron ones, about 20 feet higher than was necessary; and the girders consisted simply of tee irons, bolted to the top of the columns. When the holder was constructed, it was found so light through taking out the crown trussing, that it would not give sufficient pressure to supply the district, so great slabs of concrete were ranged all round the crown.

Well, after getting the big hole under water, the holder was eleven sheets high above the coping on the windward side, and three sheets on the leeward side. I therefore decided not to let the leeward side sink any more, and strutted up the guide-carriages with short planks. Then we extemporized Spanish windlasses, with chains from the builder's yard, from the bases of the broken columns to the windward guide-carriages, to keep the windward side in its place. The next step was to get the slabs of concrete off the top. I called on one of our men to get up and remove them, but was staggered with his reply: "Well Maister, I'm a married man. P'raps some o' these 'ere single chaps won't mind." But I could not find one single man among the crowd. Well, I thought to myself, "I'm single anyhow [I was then], so here goes." I mounted the ladder the builder had brought, and stepped on to the holder. Down I fell, and rolled over and over until stopped by one of the concrete slabs. After pulling myself together, I pushed this off with my feet, and went on to the next, and the next; the darkness, the rain, the wind, and the tremendous angle of the top of the holder, making it a delicious task. There was an awful smell of gas up there, too; and I expected every minute to pop into eternity through a hole in the crown. I shall never forget how surprised I felt to find myself back to the ladder again, and still in the land of the living, after going the whole way round in a sitting position.

We went on all night, getting the bottom curb free from the tank wall, and trying to get the holder into a bit better shape, extemporizing chafing plates for the curb to work on, by fastening lengths of flat iron on to the edges of planks, and lowering them into the tank; and when daylight appeared, we were fortunately able to borrow a number of light chain-blocks from a neighbouring factory. These we fixed on the windward guide carriages in place of the chains, and decided, when night came on, to try and get the holder to float level by supplying the town with gas out of it. While engaged with these preparations, first one and then another came during the afternoon to know whether they could hold the evening service in the churches and chapels; and thinking I could manage it, I told them "Yes!"

After they were gone, and I had time to reflect, I felt very uncomfortable; for if my plan did not answer, and the lights went out, panics would probably ensue with lamentable results. However, there was then no time to alter matters; so when it got dark I opened the outlet-valve and put on the pressure with the governor. All this time I had had the inlet-valve slightly open—just enough to keep the holder stationary. I then placed a man at each of the chain-blocks, and shut the inlet. When the pressure came down, I got these men to haul away at the blocks; and so we went on. I had made up my mind to shut the outlet-valve if the pressure got below 5-10ths, and several times it got down to 6-10ths; but hauling on the blocks fortunately always liberated it. The holder was gradually getting into shape, as the gas worked out; for the leeward side was still strutted up with the short planks, and all the gas which was being consumed consequently lowered the windward side only. The anxiety was terrible. I never remember such a long night as it seemed. At last 11 o'clock came round; and we had the satisfaction of seeing the holder three sheets high all round, while the town had had its necessary supply of gas. Next day, we borrowed some more chain-blocks, and worked the holder in this way for three months while new framing was fixed.

My next emergency was of quite a different character. We were substituting an 8-inch main for a 4-inch one in the before-mentioned town; and I went up in the evening to see how the men were getting on. I found that the foreman, in his anxiety to make a good show, had undertaken too much; and dusk had overtaken him, with several joints still to make. He and his men were doing their best under the circumstances; but as I looked along the trench, I noticed one man lying face downwards over one of the joints. I got hold of him; and found he was quite unconscious, and badly gassed. I dragged him out of the trench; and not knowing what to do for the best, it struck me that the treatment for recovering persons from drowning ought to answer, for if it removed water from the lungs it ought to remove gas. So laying him on his back, I opened his mouth, and pulled his tongue forward, and then alternately pulled his arms out beyond his head, and rammed his elbows into his ribs. Each time I did this, great gusts of gas came from his mouth; but in about ten minutes, he showed signs of returning consciousness, and was soon afterwards sufficiently recovered to be taken home.

There was an old dilapidated sulphate plant on these same works; and I thought that I might as well try and make it work. This led to my next emergency. There were a number of carboys of acid, which had been there some years; and one day after we had got the plant going, the foreman and myself were carrying one of these carboys to the saturator, when it burst all over us. Singing out to the foreman to follow me, I ran to a gasholder tank and lowered myself into it, up to my armpits. He did the same. The alkaline water in the tank completely neutralized the acid; and neither he nor I suffered the slightest injury. We then set off home, which, as I have said before, was about a quarter of a mile from the works. Our clothes (which had turned quite red), kept dropping off bit by bit, until at last both he and I had to make a bolt for it. We were getting rather too lightly clad for a civilized country.

These works were flooded once, while I was in charge of them. The water rose high enough to put out all the fires, and to fill the tar-well; but it fortunately kept out of the mains, and so did not interrupt the supply of gas to the district.

After leaving the above works, I was next in charge of one of the stations in a large manufacturing town. This was a fairly-well equipped works. One thing about it, however, caused me much anxiety. The top of the tar-well formed the coke yard; and I was in constant fear, that the red-hot coke would one day ignite the vapours in the well. That this was no groundless fear, was shown at another works in the same town, where a similar arrangement had been followed. A disastrous explosion occurred in the tar-well a few years since, causing loss of life, and laying the works idle for some months. An explosion also occurred not long ago at another works, where red-hot coke was tipped on the top of a tar-well. Tar-wells ought to be placed out of the way of fire or light in any shape.

My first emergency at these works occurred quite suddenly one afternoon. Everything appeared all right one minute; and the next the retort-lids began to smoke all over the place. Then they broke into flames; and it was evident something serious was amiss. I examined all the pressure-gauges to find out what the trouble was. And here let me say that I think one cannot well have too many pressure-gauges. I like to have one fixed on the inlet and outlet of every piece of apparatus on the works, from retort-house to gasholder. Then if anything goes wrong, it is not usually difficult to locate the place. Well, all the gauges showed a great amount of pressure; the water being blown clean out of most of them. It was apparent therefore that the trouble was at the holders; and on dipping the inlets, a lot of water was found in each. It took a couple of hours to remove the obstruction. While this was being done, the gas was blowing away at the weakest place, which I was startled to find was the sealing-box of the condensers, which was within a few feet of the boiler fires. Being apprehensive of an explosion, I had the plugs of some of the purifiers removed, and let the gas blow away there, where it could do no harm. It is well in every works, however, to plan the place with the lightest seal where there is least cause for expecting danger; as if a stoppage occurs

in the middle of the night, much harm might be done before the trouble was detected. In this particular instance, the mischief was caused by the foreman putting water in the station meters, and omitting to close the taps; the water finding its way through the bye-pass sealing-boxes, into the inlets of the holders.

The next emergency at these works was caused by a heavy fall of snow, 18 inches deep, in one night. Fearing some danger to the holders, I turned out next morning at 5 30, and made my way to the works. Tramways were laid along the road I had to traverse; and the tramway people had liberally sprinkled their metals with salt. This, together with a thaw which had set in, had converted the snow into a freezing mixture, about 6 inches deep; and hundreds of factory girls were going to their work through this awful stuff, which was clean over the tops of their wooden clogs. No doubt this is a digression; but it shows what women workers in manufacturing towns have to put up with. When I got to the works, I told off a gang of men to get on to the holders and sweep off the snow. There were no hand-rails to these holders, only a ring fixed in the centre of the crown; and I told each man to make himself fast by a rope to this ring. It was well I did so, for one of the men slipped right off the crown, and hung dangling from the rope over the side of the holder. He looked so irresistibly funny, kicking about in the air with the broom in his hand, that it was some time before the men could overcome their mirth sufficiently to help him; but at last they dragged him up again to the top of the holder, none the worse for his adventure. As showing that there is real danger from snow, one of the holders at another works in the same town, from which the snow had not been removed in time, was completely wrecked on this occasion; the weight of snow on one side causing the columns and girders to give way.

I next had charge of a corporation works, well designed and equipped, and do not remember any emergencies in connection with the works themselves. But one or two occurred in the district. One Sunday night, some excited people came to say there was a very bad escape of gas in their houses. When I arrived, I found nine houses filled with a dangerous mixture of gas and air, and a big fire burning in each. I bundled all the people into the street, much to their disgust, and opened all the doors and windows; and then extinguished the fires with buckets of water. On opening the ground, we found a fractured main. It was a very narrow escape.

The next was caused by the operations of another department of the corporation. For some inscrutable reason, the gas-main, 18 inches in diameter in the chief street, had been laid many years before 15 feet deep; and then when the sewer came to be built, this gas-main was right in the way. To get over the difficulty, the sewer had been syphoned out of the way of the gas-main; and this had caused fevers, and an endless amount of sickness. When re-paving the street, after all the setts had been removed and the ground dug up, the Committee suddenly remembered this weak place in the sewer, and called on me to get the gas-main out of the way. There was only one course out of the difficulty, as the main was so deep, and that was to syphon the main out of the way of the sewer. I had therefore to get four 18-inch square bends and an 18-inch syphon; and as there was a 12-inch branch on one side and an 8-inch one on the other, two suitable tees were also necessary. There was no time to get anything made; consequently I had to use what I could find, and with a gas-bend from one town and a water-bend from another had to tackle the job. It took a lot of chisel work to pare some of the spigots down; but at last we got them to go together, and the next Sunday we started at 3 o'clock in the morning. Men never worked harder than our men did that day; but what with the difficulty with the sewage, which was running all the time, night came on and the work was unfinished, and I found it necessary to trust to the gas-bags. The anxiety was great; if one of the bags had burst, I really do not know what we should have done. Fortunately they all held fast; and we got the thing together all right next day. But I fervently hope never to have such a job again.

Since then I have often found the day too short to make necessary connections, when carrying out some extensions in the works themselves, and have found the following a capital way out of such a difficulty: Suppose we are trying to make 24-inch connections, and have not time to finish. This work is generally done in the summer, when a smaller pipe would suffice for the gas we are making. Take a piece of (say) 8-inch pipe; put an end into each of the 24-inch pipes which there is not time to couple together with 24-inch connections; and then fill up the space all round the 8-inch pipe with brickwork in portland cement, and when finished render the face with neat cement. This will soon set and make a gas-tight joint, and can be easily removed the next morning. If the time is very short, mix the cement with hot water, and it will set more quickly; and if some soda is put into the hot water, more quickly still.

My first emergency at the next works of which I was in charge happened as follows: I was called out of bed one night, and when I got into the works, every retort lid was blazing; while such dense volumes of smoke poured out of the retort-houses, that it was difficult to see one's way about. Fortunately, everyone was asleep at the time, or we should have had the fire-engines and a crowd of people. All the pressure-gauges were in a troubled state. The three retort-houses all discharged into an underground foul main, from which the tar, &c., drained off into the tar-well. It struck me at once that this main was water-logged, through the tar-well being too full; but on setting a man to examine the tar-well, I was rather nonplussed to hear it was all right. I tried everywhere else, but could not find any clue. Explosions were taking place in the hydraulic mains, with reports like distant thunder; and the mouthpieces and ascension-pipes were getting red hot. We therefore went back to the tar-well; and, on examining it again carefully, we found that the man had made a mistake in his excitement, and the well was full to the brim (it was a ridiculously small well, by-the-bye). It took us a couple of hours to get the surplus water out; and on hunting for the cause we found that a man who had been set to run some water into the hydraulic main in one of the retort-houses, to restore the seal, had not shut the tap off, and it being connected to the water-mains the tar-well had got flooded out. Of course, I had the connection removed after this, and would never again have hydraulic mains coupled up to water-mains. The best plan is to connect to an overhead liquor tank; it is then impossible to flood the tar-well.

Another emergency was caused by a blizzard. A hurricane blew all one night, accompanied by very fine snow, blocking all the roads and railways, and cutting off the town's water supply, which passed through an open channel, for some distance from its source. For nearly a week, we were cut off from the rest of the world. We could get no coal into the works, and no coke out. We ran short of lime for purifying, and had to put down the sulphate plant for want of acid. But the greatest difficulty was with the coke. We used all the snow up to quench it, and took all the water we could from the gasholder tanks: but one night the coke-yards were all on fire, and it was with the greatest difficulty we saved the works from destruction. That was a week none of us is ever likely to forget.

At another time we had the coals on fire in all the stores simultaneously. It was necessary to get a good stock of sea-borne coal in during the summer; and every winter this coal fired through spontaneous combustion. We found nothing was of any use but using the coal up. Playing on it with water, or even with ammoniacal liquor, simply drove the fire further in, and caused it to break out afresh.

Another emergency was caused by the pig-headed stupidity of one who ought to have known better, which resulted in all the holders being emptied about 9 o'clock one night; there being nothing after that hour but the make. All the holders were aground save one, and that was only just afloat; one rivet only being above water. I was fearful, if this holder also got aground, that the governors supplying the high-level districts would collapse; so for 2½ hours we had to fight to keep this one rivet above water. That the draught of gas in a high-level district will cause a governor to collapse, was proved when one of these districts was first supplied with gas; when the inlet valve being accidentally shut, the governor collapsed, and was wrecked.

Another emergency was caused by a holder, to which a third lift had been added on Gadd's principle. This system is excellent in itself; but in this particular holder there was such a lot of play at the bottom guide-rollers of both the old lifts, that the holder had a knack of getting out of level a good bit, and one day I was alarmed to find one of the cups was unsealed, and gas was pouring out of the holder. With much difficulty, we got the cup sealed again, and afterwards adopted measures to prevent a similar occurrence. But it brought it home to me pretty forcibly that it is not wise to add an additional lift to an old holder and send it up above the framing, unless each lift of the old holder is rigidly guided by its bottom rollers.

A fruitful source of stoppages, in my experience, has been the ridiculously small pockets some makers put in their station meters, to act as outlets. These get choked with naphthalene, and are very difficult to deal with, as they can only be cleaned out by taking some of the top plates off the meter. If manufacturers would only make this pocket more commodious, they would relieve managers of a considerable amount of anxiety.

Favourite places for the deposition of naphthalene, as I daresay most of us have found out, are the outlets from the washer and the station meter, as the gas is brought into sudden contact with cold water at these points; and I have found it very desirable to have plenty of manholes on the mains leading from the washer and the station meter. Then choked pipes can be thoroughly cleaned out in the summer. For want of these I have had to remove pieces from the mains, and extemporize manholes many times—in fact, I have never had charge of a works where there were adequate means for getting at, and cleaning out, blocked underground pipes. Sometimes it is impossible to throw choked pipes out of action in the depth of winter; and then a good way to get a passage through them is to steam them. If a liberal quantity of naphtha is added to the feed water of the boiler, the naphthalized vapour will very quickly melt the naphthalene; and it can then be pumped on to the syphons. Of course, care must be exercised in the steaming operations, or damage may be caused to the apparatus.

The faces of purifier centre-valves getting out-of-true have at various times caused me much uneasiness. The best thing to do is to throw the valve and purifiers out of action, and scrape the faces until they are true again. But it often happens that purifiers cannot be spared; and then some other course must be adopted. I have found a good plan is to pour a liberal amount of pure sperm oil on to the faces of the valve, before and after changing. I remember once, when the test papers were quite black at the station meters, and it was quite impossible to

do anything else, the liberal use of sperm oil pulled us through the winter, without anyone suspecting the dilemma we were in. Large centre-valves often get out-of-true through the different temperatures caused by the process of purification in the boxes themselves; variations in temperature causing different degrees of expansion in the metal. This makes large centre-valves objectionable.

The cups of holders being too shallow have sometimes caused me considerable anxiety. The seal can be increased by bolting angle irons all round on top of the lute. These can be of any desired depth. I have known the seal to be increased 4 inches in this manner. It is always best, when designing apparatus, to make all cups, either of gasholders, purifiers, or other plant, of ample depth. There is then a margin to work on in times of difficulty.

The overheating of the material in purifiers has been another source of trouble. I have found that purifiers in which the material has got dangerously heated can be cooled down by rigidly excluding every particle of oxygen or air from the gas which is passing through them.

When getting a holder into action after repairs, considerable care is necessary, as there will be a certain amount of air in the crown; and I have found a good plan to get it out is to lower a tube through a hole in the crown, until it is but a few inches from the surface of the water, as all the air will accumulate there and can be removed in this manner. Before turning gas from such a holder into the district, it is well to run a few sheets of gas into it from another heavier holder, through both inlet and outlet; as any air which may be left in the holder will settle in these pipes, and might cause trouble if sent out undiluted.

Discussion.

The PRESIDENT said they had had a very interesting as well as amusing paper from Mr. Townsend; and a great deal of real knowledge and information was to be derived from it. He should be pleased to hear the experiences of members in getting over their emergencies.

Mr. R. G. SHADBOLT (Grantham) said that, if they were all to relate their various experiences in the way Mr. Townsend had done, they would be there for a twelvemonth. He had expected something humorous, and of practical value; and he had not been disappointed. Without attempting to relate all his own experiences, which he should be very sorry to do, he must refer to one little incident that occurred to him, because of its similarity to one of Mr. Townsend's experiences. It was with respect to the bursting of a carboy of vitriol. One severe winter the water seemed to have separated out from the acid and become a solid block of ice in the bottom of the carboys. They were using a direct-fire still, and had the carboys ranged round the top of the still to thaw. On picking up one of the carboys, it collapsed, and saturated him and a labourer with vitriol. They had a gas-holder tank close at hand, and also a condenser consisting of a few pipes running backwards and forwards about the tank; and they had a water riser, which had been turned off for some considerable time. Believing, as Mr. Townsend had done, that water was the best remedy for them in their condition, they unthinkingly tumbled into a cauldron of nearly boiling water, which they quickly got out of again. He wished to express his best thanks to Mr. Townsend for formulating what had been generally speaking the experience of most of them.

Mr. W. NEWBIGGING (Manchester) remarked that a noisy, excitable crowd usually gathered round a gas-works when there was an accident; and he was curious to know whether there was a crowd assembled when Mr. Townsend pushed the slabs of concrete off the top of the holder in the way he had described, and whether any fell among the crowd.

Mr. TOWNSEND said he would relieve Mr. Newbigging's mind at once by saying that that did not happen.

Mr. E. A. HARMAN (Huddersfield) said they were not generally proud of their emergencies; and it was therefore especially plucky of Mr. Townsend to relate so many as he had that afternoon. Too frequently they found that the failures had resulted from the neglect of those under them, for whose actions they were to a certain extent indirectly responsible; therefore Mr. Townsend's paper had been especially instructive to them. At the last meeting of The Gas Institute, Mr. Stelfox had related the failure he experienced with the Claus process; and he ventured to think that the history of that gigantic failure was almost as profitable as the experiments. What they learnt from Mr. Townsend's paper was as to the necessity of doing what the Irishman described as "putting one's foot down with a firm hand," and always seeing that their apparatus was in a proper state of repair.

Mr. TOWNSEND, in reply, said he had a considerable amount of hesitation in bringing forward the paper, because, as had been remarked, they were not proud of confessing their failures; but as most of these things had occurred from causes over which he had no control whatever, he felt to some extent relieved from any imputation of blame. He had received a note from Mr. Charles Wood, regretting that he would not be able to be present, and in which he said: "I notice two slight inaccuracies in your reference to Bradford. In reference to the Valley Road explosion, this was not caused by hot coke, but by the gases from the well finding their way to the retort-bench through a large crack caused by the settlement of the foundations. The works were only 'laid aside' for 3¾ hours, and not for 'several months.' The 18-inch snowstorm you mention certainly did not 'completely wreck' any holder in Bradford. If you mean the Clayton accident, I was not aware that the snow had anything to do with it; but, at any rate, Clayton is not 'in the same town.'" He had not mentioned any names in his paper; but in the cases he had referred to, he had tried to pick out those which conveyed a moral, and which might be of assistance to the members. With regard to what Mr. Wood had said, he must admit that he used too strong an expression when he said that the gasholder was "completely wrecked."

VOTES OF THANKS.

Mr. C. A. CRAVEN (Dewsbury) then proposed a vote of thanks to the readers of the papers. With regard to the first paper, he did not join in the discussion because he had not had any experience with dry mains; but he must say that he thoroughly sympathized with Mr. Kendrick in his experiences. As to Mr. Townsend's paper on emergencies, which they had appreciated so much, he was sure that it would prove very useful, because it would bring before people a series of experiences to which perhaps they were strangers, and show them how to promptly deal with any emergency that might arise. He could write a large book about his own experiences; and the only way to discuss such a paper as Mr. Townsend's was by telling another story. In conclusion, he thanked the readers of both papers for their contributions.

Mr. T. B. BALL (Rochdale) had much pleasure in seconding the vote of thanks. As Mr. Craven had very justly remarked, Mr. Townsend's paper could only be discussed by the relation of other experiences, if not similar, at any rate involving the exercise of prompt judgment under severe conditions; but how far the patience of the meeting was equal to listening to a number of these stories, was open to question. There was no doubt that one man's experiences were always useful to another; and for this reason they were indebted to Mr. Townsend for the relation he gave of the steps he took with regard to his own emergencies. He could not discuss the question of dry mains, having had no experience with them at all; but he had had quite sufficient experience with wet mains to entirely satisfy him. Although wet mains left much to be desired, he gathered from Mr. Kendrick's experience that there was such a thing as getting out of the frying-pan into the fire in that respect; and, under the circumstances, he preferred to remain in the frying-pan.

Mr. ISAAC CARR (Widnes), in supporting the resolution, said he had intended to compliment Mr. Townsend on his paper, because, while it had been pleasant to listen to, it had been very instructive. A recital of their difficulties and troubles was certainly helpful to others. While Mr. Townsend was reading his paper and speaking of his various experiences, it brought back to his mind things that had happened to him in years gone by, which were not pleasant to think about now—such as leaving a town in darkness for four or five days together.

The resolution was passed unanimously.

Mr. KENDRICK, in returning thanks, said he had probably derived more benefit from the preparation of his paper than the members had from listening to it. The kind manner in which his paper had been received, would give him an incentive to do better in future.

Mr. TOWNSEND also returned thanks to the members for the resolution just passed.

Mr. S. MEUNIER (Stockport) then proposed a vote of thanks to the Committee and Officers of the Institution. No Institution of this kind, he said, could go on without a Committee and Officers; and no doubt a great deal of useful work was done by them.

Mr. W. W. HUTCHINSON (Barnsley), in seconding the resolution, said they were much indebted to the Committee and the Officers for the work they had done. There were a great many points to watch in connection with keeping up the prestige of the Institution, and seeing that it increased both in numbers and in usefulness.

The resolution having passed unanimously,

Mr. R. PORTER (Elland) briefly responded on behalf of the Committee.

DR. BUNTE ON INCANDESCENT LIGHTING, ACETYLENE, AND THE DEVELOPMENT OF FLAME ILLUMINATION.

(*Concluded from p.* 399.)

The latest departure in illumination by means of flame was due to the co-operation of chemical and electrical technology. After Moissan's discovery of calcium carbide, Willson began its commercial production about three years ago, and thus initiated the employment of acetylene for artificial lighting. Acetylene is, in a sense, a typical illuminating gas; and Professor Lewes has attempted to trace the photogenic property of all hydrocarbon flames to a preliminary formation of acetylene. It is a gas consisting of 92·5 per cent. of carbon and 7·5 per cent. of hydrogen; and, volume for volume, it has about fourteen times the illuminating power, and double the heating power, of ordinary coal gas. It ignites at 896° Fahr., which is lower than the temperature of ignition of any other gas; and it decomposes at about 1300° Fahr., with deposition of carbon. When burnt in air, it produces a maximum temperature of 4388° Fahr., which is higher than that afforded by any other combustible gas. The high temperature of combustion and the large quantity of

carbon which is separated account for the extraordinarily high illuminating power of the acetylene flame. It is not surprising that calcium carbide and acetylene have attracted much attention. In the past two years, letters patent have been obtained in England for about 500 inventions relating to them.

There are, however, some hindrances to the practical application of acetylene. The poisonous properties once attributed to the gas have indeed proved visionary; and pure acetylene is now recognized as a relatively harmless gas. But the dangers of explosion cannot unfortunately be refuted. In order to minimize this disadvantage, attention has been drawn to the fact that coal gas forms an explosive mixture with air, but nevertheless has found wide application. In reality, however, the conditions are very different. With coal gas and air, only specific mixtures, containing from 7 to 30 per cent. of the gas, can be exploded. But with acetylene the danger extends to almost all mixtures with air. The extreme cases of less than 5 per cent. of acetylene, or less than 20 per cent. of air, are the only mixtures of air and acetylene which are not explosive. Furthermore, the high specific gravity and low rate of diffusion of acetylene hinder uniform admixture; and danger is therefore greater than in the case of coal gas. The low temperature at which acetylene ignites still further aggravates the risk. The rate of propagation of the combustion is much higher with acetylene than with coal gas; and thus acetylene gives a much more violent explosion. In the hands of experts, however, the most violent detonating gases can be burnt without risk, as ignition does not extend backwards in a tube of about 0·02 inch diameter internally; and the extremely explosive mixtures of air and acetylene which are formed when acetylene generators are first put in action can thus be ignited and consumed without danger in ordinary burners. But under a pressure of more than two atmospheres the gas unmixed with air is liable to decompose, with liberation of heat and explosion, to carbon and hydrogen; for it is an endothermic compound. Liquefied acetylene especially exhibits this disposition to decompose; and its production, which was attempted on a commercial scale, has therefore been abandoned. Calcium carbide indeed contains acetylene in a more concentrated form than does the liquefied gas. A pound of carbide occupies a space of about 0·0072 cubic foot, and yields 4·8 cubic feet of gas, which on liquefaction has a volume about double that of the carbide. For transport, therefore, carbide is the most suitable.

The decomposition of carbide takes place according to the simple formula—

$$CaC_2 + 2\,H_2O = CaO\,.\,H_2O + C_2H_2$$

But the evolution of heat—which under certain conditions suffices to ignite the gas—and the "after development" of the gas, are attendant phenomena which cause innumerable difficulties. Apart from the many attempts to distribute and dissipate the heat, there may be mentioned means proposed for minimizing the violence of the reaction—such as the dilution of the water with alcohol or glycerine, and the use of saline solutions. A very considerable rise of temperature must, however, occur, because the quantity of gas evolved is too small to carry off the heat developed. The idea of avoiding local heating and of abstracting the heat by the addition of gas naturally presents itself; and gas laden with aqueous vapour appears the most suitable. If the gas thus employed is acetylene, the aqueous vapour decomposes the carbide and increases the volume of acetylene; and by means of a steam-jet for the circulation of the gas, the generation of acetylene may thus be carried out without considerable local heating. Or coal gas or oil gas saturated with steam may be used, and thus carburetted with acetylene.

With regard to the prospects of acetylene as a practical illuminant, there are undoubtedly uses for it, even if it cannot compete with illuminating coal gas supplied from large works, and if it is valueless as an enriching agent. But a technical difficulty has first to be overcome—viz., the blocking of the burners which very readily occurs. The difficulty does not appear insuperable. Acetylene has already been employed for railway purposes. The satisfactory lighting of railway carriages was in the first instance due to the energy of Messrs. Pintsch, whose method of lighting by oil gas has been adopted in all parts of the world. According to statistics lately published, 76,000 passenger carriages and 3000 locomotives are now equipped with gas lighting—for the most part applied to them within the last twenty years. There are, further, hundreds of buoys lighted with gas, which have added much to the safety of travel on water. The gas used in all these cases is produced from paraffin oil, and stored in wrought-iron holders under a pressure of 6 to 10 atmospheres. One cubic foot of gas yields about 7·08 candle-hours. For the proper lighting of a railway carriage for about ten hours, say by 200 candles, there would be required about 530 cubic feet of coal gas, 280 cubic feet of oil gas, but only 53 cubic feet of acetylene. Evidently the small volume of acetylene needed would give it an immense advantage for the lighting of carriages, &c. Nevertheless, the possibility of causing explosion if the gas were stored under pressure, and the ready blocking up of the burners, have so far prevented the adoption of acetylene alone; and at the present time a mixture of acetylene and oil gas is being used. The 53 cubic feet of acetylene required to light a railway carriage for ten hours could be produced from 11·02 lbs. of calcium carbide, occupying a space of only 0·08 cubic foot.

The advantages in this and similar instances of a simple and safe method of generating acetylene gas from carbide are very evident. In fact, carbide appears to be a pre-eminent accumulator of light, since 1 lb. yields acetylene capable of affording 190·5 candle-hours. On the other hand, lead accumulators for electric lighting afford only 6·3 candle-hours per pound weight of the accumulator, or about the thirtieth part of the light obtainable from the same weight of carbide. Therefore, wherever weight for transport is of moment, the chemical accumulator, carbide, has an immense advantage over electrical accumulators; and consequently illumination by flame again takes precedence of electric lighting. It has not yet been quite satisfactorily decided how acetylene may best be generated from carbide; but there is no doubt that the problem will soon be solved, and then acetylene will find many applications.

—	Illuminating Value in Candles per 1000 Cubic Feet Consumed per Hour.	Consumption per Candle-Hour, in Cubic Feet.	Hourly Cost of a Light of 17½ Candle-Power, in Pence.
Coal gas—			
Flat-flame and argand burners	3,303	0·303	0·290
Siemens regenerative lamp .	5,637	0·177	0·162
Incandescent gas-light—			
Old pattern mantle . . .	12,416	0·080	0·076
New „ „ . . .	14,899	0·067	0·063
Gas under increased pressure	24,833	0·040	0·038
Acetylene	38.317	0·026	0·193
	Per Pound Consumed per Hour.	Grains.	
Petroleum	132	52·8	0·180
Spirit incandescent light . . .	132	52·8	0·215
		Watts.	
Electric incandescent lamp . .	..	4·56	0·546

Cost of illuminant, at Berlin prices: Coal gas, 4s. 6d. per 1000 cubic feet; acetylene, £1 15s. 4d. per 1000 cubic feet; petroleum, 1·35d. per lb.; spirit, 1·63d. per lb.; electric current, 6·8d. per 1000 watts.

A glance at the development which twenty years have witnessed in illumination by flame will be most instructive. The above table shows that twenty years ago, when only flat-flame and argand gas-burners were available, 1000 cubic feet of gas, costing in Berlin 4s. 6d., afforded only 3303 candle-hours, and that therefore the light of about 17·5 candles, which an ordinary gas-flame generally gives, cost 0·290d. In the beginning of the eighties, regenerative burners gave almost double the illumination for the same cost. Then the incandescent burners reduced the cost of the same illumination about one-fourth. This is a tremendous advance accomplished in a very brief space of time. The table shows also comparative results for acetylene, incandescent spirit, and petroleum and electric lamps. Notwithstanding the immense increase in the light obtainable from gas, and in spite of the bids of electric lighting for public favour, the consumption of gas has progressed at a greater rate in the last quarter of a century than ever before. The make of the gas-works of Germany in 1868 was, in round figures, 5300 millions; in 1896 it was about 25,500 millions. The advance in the demand for artificial illumination which the present generation has witnessed is due in no small degree to the stimulus which the competition of electric lighting gave to the old methods of illumination by flame. Stagnation has been prevented, and brilliant scientific developments have opened up a fresh period of prosperity for the older industries, and especially for gas lighting.

Dr. Bunte subsequently delivered the same lecture before the German Chemical Society, and since its publication in the "Journal für Gasbeleuchtung" it has appeared in the "Berichte" of the Society. A correction of importance has been made from the later text of the lecture.

BURNERS FOR ACETYLENE.

Dr. Paul Wolff, in a series of four articles in the "Zeitschrift für Beleuchtungswesen," records a number of comparative tests of various burners for the consumption of acetylene, and incidentally gives some interesting information on the illuminating value of that gas.

Dr. Wolff points out that the cost of illumination to a given degree varies with the efficiency of the burners employed; and he states that many false comparisons of the cost of lighting by acetylene and other illuminants have been made owing to the use of unsuitable burners. The luminosity of flame arises from the incandescent carbon; and the intensity of the light depends on the amount of carbon separated in the flame, and on the temperature produced by the combustion, and therefore secondarily on the heat of combustion and the quantity of the hydrocarbons of the gas. Thus acetylene has extraordinarily high illuminating power; for it is a pure hydrocarbon containing 92·31 per cent. of carbon, and its heat of combustion is about 14,000 calories, against 5500 calories for coal gas. The very richness in carbon to which it owes largely its high luminosity, is, however, the chief source of difficulty in burning the gas for

the proper development of that luminosity. A part of the carbon in the interior of the flame does not obtain sufficient atmospheric oxygen for its perfect combustion unless special burners are used; and the flame becomes smoky. For the proper combustion of acetylene, a much more intimate mixture of the gas and the air than an ordinary burner affords is requisite. Many methods of meeting the difficulty have been proposed, and they may be reviewed with advantage.

The thickness of the flame may be reduced so that the surface exposed to contact with the air is increased. The pressure of the issuing gas may be increased, in order to induce a fuller current of air to the flame. The acetylene may be diluted with air or nitrogen, to render it more accessible to the air; but dilution with air cannot safely take place before the burner, which therefore must be of the bunsen type, but must have the air supply so proportioned with respect to the gas that the flame is fully luminous. Or the acetylene may be diluted with a combustible gas, such as hydrogen or methane. Whatever means are adopted for burning the gas, the illuminating power will vary according to the pressure; and the most favourable pressure in one case will often not answer well in another. The illuminating power of acetylene is also very much affected by impurities in the gas; and different samples of commercial carbide yield gas differing by several candles in value when consumed in the same burner. The tests with various burners might have been made with perfectly purified acetylene; but they would not then have agreed with the results ordinarily obtained. Perfectly pure acetylene is not a suitable gas for distribution, as it has only a faint ethereal odour, and leaks would be detected with difficulty. Acetylene from commercial carbide retains, when freed from its grosser impurities, a sharp penetrating odour.

The descriptions of burners for acetylene may be broadly divided into those which are supplied with acetylene simply, and those which are supplied with acetylene and air. Those of the first order may be subdivided into: (1) Burners with one or more round orifices independent of one another, or jet burners; (2) those with two orifices inclined towards one another, or butterfly burners; and (3) those with a slit as the orifice, or batswing burners.

Jet burners give a narrow, tall, lancet-like flame; and where more than one orifice is used, the jets incline outwards from the burner-tip, which is best made in steatite—as, indeed, is the case with all burners for acetylene. Jet burners of aluminium are made in Paris. Eight different jet burners were tested, at pressures ranging from 24-10ths to 36-10ths; and the results are given in detail by Dr. Wolff. On the whole, they are only moderately good, as the shape of the flame prevents air penetrating to its interior, and the light from the interior has to pass through the envelope of the flame, which is peculiarly impervious to light. The absolute intensity of the light from each burner increases with the number of the orifices; but the duty remains about the same. The duty, however, increases within certain limits with the diameter of the orifice. The highest efficiency obtained with burners with only one orifice, showed an hourly consumption of 0·04 cubic foot per candle power; and two burners, one of German and one of Paris make, both afforded this duty. A three-hole burner of Paris make developed a light of 18-candle power under a pressure of 24-10ths; and the consumption was equivalent to 0·033 cubic foot per hour per candle. This duty was the highest obtained with any jet burner, and was about double that found with some German burners with from one to five orifices.

Butterfly, or fishtail, burners are well known, as they are much used for coal and oil gas. The impact of two jets on one another, produces a flame of small thickness and large surface-area. For acetylene gas, Bray burners with very small orifices are the most suitable of this type. Dr. Wolff attributes differences between his observations with these burners and tests made by Herr Gerdes* to variation in the quality of the acetylene consumed; but he points out that Herr Gerdes used a pressure of 33½-10ths, whereas he found 24-10ths more favourable. At this pressure, the 0000 Bray burner gave a light of 75-candle power at a consumption equivalent to 0·018 cubic foot of acetylene per hour per candle. It has been generally assumed, from Herr Gerdes' results, that the highest efficiency attainable with Bray burners is a consumption of about 0·024 cubic foot per hour per candle power; but Dr. Wolff obtained a considerably higher efficiency with the 0000 burner. The fault of the Bray burner for the consumption of acetylene lies in the tendency it exhibits to become blocked with carbon, arising from the polymerization of the acetylene. The deposit of carbon frequently blocks the narrow channels in the burner, and renders a renewal of the latter necessary. Frequent renewals would not form a considerable item in the expenses; but they would necessitate the attendance of a man competent to change the burners, and thus Bray burners would be unsuitable for use in private houses. Attempts have been made to minimize the risk of blocking the channels, by making the burners with a mushroom-shaped top of steatite, from which a small nozzle protrudes. But the mushroom top casts a shadow; and the blocking of the burner is not wholly avoided. Better results are obtained with burners consisting of two curved tubes, the mouths of which are so set that the jets of issuing gas impinge on one another at some little distance from them, and produce a flat flame of rather greater thickness than that afforded by the ordinary fishtail burner. The efficiency is not so high as that of the latter; but the burners are cheap, and suitable for use in dwelling-houses. One of these burners, of German origin, gave a light of nearly 20-candle power at a gas pressure of 36-10ths; and the consumption was equal to 0·0285 cubic foot per hour per candle. These burners cannot be economically employed in clusters, owing to the opacity of the acetylene flame; but two may be ranged alongside, provided the flames lie in the same vertical plane, or, in other words, are set edge to edge. Argand-pattern burners on the fishtail principle gave very inferior results with acetylene; and the use of a chimney deteriorated the illuminating power of the flame.

The slit, or batswing, burners suitable for acetylene have a very narrow slit. The burner-tip is always made of steatite. Specimens manufactured in Paris, Nuremberg, and Berlin were tested. A No. 3 burner of Paris make showed a nearly constant efficiency at all pressures from 28-10ths to 38-10ths. The illuminating power ranged from 62 to 85½ candles; but the consumption was in all cases nearly 0·0207 cubic foot per hour per candle power. A large burner of German make gave an illuminating power of nearly 87·7 candles; and the consumption was equal to about 0·0201 cubic foot per hour per candle. The cheapness of the batswing burner, the shape of the flame, the slight variation in efficiency over a considerable range of pressures, and the ease with which obstructions or deposits of carbon can be removed, all speak in its favour.

Many difficulties present themselves in the apparently simple problem of constructing a burner for the consumption of a mixture of air and acetylene. If the air supply is too small, the flame smokes; if it is too great, the flame is partially disillumined, and has a great tendency to light-back. The air supply is, of course, chiefly dependent on the pressure of the gas. The atmospheric burners first constructed only worked satisfactorily at a very high gas pressure. The best results so far obtained have been with atmospheric batswing burners, having a slit of about the same width as that in ordinary gas-burners. Large burners showed the highest degree of efficiency. At a pressure of 31½-10ths, a burner of German make gave a light of 61-candle power; and the consumption was equal to 0·025 cubic foot per hour per candle. The slit did not become choked; and a clear bright flame free from smoke was secured. This burner is particularly suitable for use where constant attention cannot be devoted to cleaning or renewing burners used for the acetylene.

Mixtures of acetylene with other gases may be burnt from ordinary coal gas burners, and therefore need not be considered in detail. Bullier protected the employment of a mixture of acetylene and nitrogen; Bouvier patented a process for the manufacture of a material which yielded acetylene and carbonic acid when acted upon by water; and Lewes protected the production of a mixture of calcium and manganese carbides which reacted with water to form acetylene, methane, and hydrogen. The effect of additions of other gases on the illuminating value of acetylene is being studied; and the following figures taken from researches made by Bullier indicate what has already been accomplished. The best results with mixtures of nitrogen and acetylene were secured when from 50 to 80 per cent. of the latter gas was present. Under these conditions, from 0·027 to 0·032 cubic foot of acetylene was consumed per hour per candle power. In mixtures of acetylene and carbonic acid, the percentage of the latter must not exceed 20 per cent., or the illuminating value will be greatly diminished. With this proportion of carbonic acid, 0·027 cubic foot of acetylene is consumed per hour per candle power. Acetylene affords precisely the same duty when mixed with hydrogen and consumed from large burners. A mixture of equal proportions of acetylene and air yields 1 candle-hour per 0·023 cubic foot of acetylene; but such a mixture is explosive, and cannot be consumed under ordinary conditions. Oxygen raises the illuminating power of acetylene; but in this case also the explosiveness of the mixture precludes its general employment. It thus appears that all practicable admixtures diminish the illuminating duty of the acetylene; but the advantage of consumption in an ordinary burner may be secured by them. The apparatus necessary for the production of a uniform mixture would, however, add greatly to the cost of the gas. But if a mixture of carbides, such as that proposed by Lewes, can be produced at a price which will compare favourably with that of calcium carbide, there should be an extensive use for the mixture of acetylene with hydrogen and other combustible gases, which such a mixture of carbides affords.

It must be admitted that there is at present no burner for acetylene which presents all the following advantages: High illuminating efficiency, faultless operation, durability, and cheapness. There are, however, a number of burners which possess more than one of these points, and only relatively trifling faults. The illuminating value of acetylene, according to Dr. Wolff's results, when calculated to the standard English rate of consumption of 5 cubic feet per hour, has the following maximum values according to the burners used:—

	Candles.
Triple-jet rat-tail burner	= 151
Atmospheric batswing burner	= 200
Large batswing burner	= 249
0000 Bray burner	= 278

* See "JOURNAL," Vol. LXIX., p. 1248.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Standards of Light.

SIR,—Mr. J. Vincent Taylor's comments in last Tuesday's "JOURNAL" on my recent article on "Standards of Light" (*ante*, p. 227) are somewhat incoherent. The question of writing under a *nom de plume* is purely one of diplomacy, and affords a writer a freedom of criticism not available if he appended his name. I presume that Mr. Taylor must appreciate this, although he apparently requires reminding of it. Possibly he is in a sufficiently independent position to ignore it; but many other people are differently situated.

Mr. Taylor says that when I stated that I did not regard photometry as an exact science, I did not locate the exact geographical position to which I referred. What the exactness of photometrical science has to do with longitude or latitude, I leave Mr. Taylor to determine, although I admit that a certain amount of "latitude" sometimes comes in according to the "bias" of the experimenter.

I totally disagree with Mr. Taylor as to the reliability of the ten-candle Dibdin standard as a unit of light, *versus* the old sperm candle. My experience is that, in competent hands, the former is reliable, and, what is possibly more valuable, entirely under control, whereas the so-called standard sperm candles have their special whims and fancies. You are not allowed, under any official conditions, to manipulate them; and if you were permitted to do so, the results would vary according to the ideas of the manipulator. We cannot, in this "mundane sphere," get absolute truth; but let us try to get the nearest approximation.

The main question appears to me to be very simple. Of two evils, choose the less. Which is worst—the Dibdin ten-candle standard or ordinary sperm candles? In my opinion and experience, there is nothing against the former, with the exception that it is rated too high. With regard to so-called standard candles, my allegation is that they are in most cases unreliable; and considering the serious responsibilities which gas companies have to fulfil, it is grossly unjust to victimize them under a Special Act of Parliament with a standard which may pass 16-candle gas as 17-candle, for which they get no credit, or else reduce 16-candle gas to 15-candle, for which they might be fined £100 per day.

VERITAS.

Feb. 26, 1898.

The Trade in Alizarine.

SIR,—Referring to the speech made by Mr. Livesey at the half-yearly meeting of the South Metropolitan Gas Company, and reported in your issue of Feb. 22, we think it right to correct at least two of the statements made by this gentleman regarding alizarine.

In the first place, alizarine was never manufactured by the firm of Messrs. Simpson, Maule, and Nicholson; and next, it is not correct to state that "the trade had gone to the Germans—the colour makers." The manufacture of alizarine in this country was commenced in the year 1869 by Messrs. Perkin Bros., whose works, together with the patent rights, were purchased in the year 1874 by Messrs. Brooke, Simpson, and Spiller, who two years later disposed of them to Messrs. Burt, Boulton, and Haywood. In 1882, the latter firm transferred their alizarine business to this Company, the principal shareholders of which are the turkey-red dyers and calico printers of Great Britain. Since this Company was formed, our business has increased in volume nearly 150 per cent.; and the fact that we supply the bulk of the British demand does not coincide with the statement that "the trade had gone to the Germans."

We would not have troubled you with this communication, but for the general disposition to assume that coal tar colours, to be of the proper quality, and to be manufactured economically, must be "made in Germany." As far as alizarine is concerned, we are naturally desirous that this false impression should be removed.

E. T. JAMES, Secretary,
The British Alizarine Co., Limited.

Silvertown, E., Feb. 28, 1898.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time: Aberystwith Gas Bill, Bacup Corporation Water Bill, Bakewell Gas Bill, Blackpool Improvement Bill, Bury Corporation Bill, Carlisle Corporation Water Bill, Edinburgh and District Water Bill, Edinburgh and Leith Corporations Gas Bill, Felixstowe and Walton Water Bill, Folkestone Gas Bill, Folkestone Corporation Water (Transfer) Bill, Folkestone Water Bill, Halifax Corporation Bill, Hamilton Water Bill, Heywood Corporation Water Bill, Kettering Water Bill, Market Harborough Gas Bill, Morley Corporation (Gas) Bill, Morley Gas Bill, Newhaven and Seaford Water Bill, Newtown Water Bill, Redhill and Reigate Gas Bill, Rochdale Corporation Water Bill, Sheringham Gas and Water Bill, Stirling Gas Bill, Swansea Gas Bill, Todmorden Corporation Water Bill, Tynemouth Corporation Water Bill, Waterford City Gas Bill, Wath-upon-Dearne Urban District Council Bill, Yeovil Corporation Bill, Yeovil Gas Bill.

The Todmorden Corporation (Water Transfer) Bill has been withdrawn.

Petitions have been presented against the following Bills: Aberystwith Gas Bill, Bacup Corporation Water Bill, Bury Corporation Bill, Carlisle Corporation Water Bill, Edinburgh and District Water Bill, Edinburgh and Leith Corporations Gas Bill, Folkestone Corporation Water (Transfer) Bill, Folkestone Water Bill, Halifax Corporation Bill, Heywood Corporation Water Bill, Kettering Water Bill, Market Harborough Gas Bill, Morley Corporation (Gas) Bill, Morley Gas Bill, Newcastle and Gateshead Water Bill, Newtown Water Bill, Rochdale Corporation Water Bill, Todmorden Corporation Water Bill, Tynemouth Corporation Water Bill, Wath-upon-Dearne Urban District Council Bill, Yeovil Corporation Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Carmarthen Improvement Bill, Coventry Corporation Gas Bill, Crawley and District Water Bill, East Ham Improvement Bill, Frodingham Gas Bill, Haslemere District Water and Gas Bill, Ilkeston Corporation Bill, Keighley Corporation Bill, Leyton Urban District Council Bill, Matlock Urban District Council Bill, Middlesbrough Corporation Gas Bill, Northam Urban District Water Bill, North Warwickshire Water Bill, Paignton Improvement Bill, Rhymney and Aber Valleys Gas and Water Bill, St. Helens Corporation Bill, Staines Reservoirs Joint Committee Bill, Wishaw Water Bill.

Petitions have been presented against the following Bills: Brompton, &c., Water Bill, Carmarthen Improvement Bill, Clacton-on-Sea Gas and Water Bill, Coventry Corporation Gas Bill, Cranbrook District Water Bill, Crawley and District Water Bill, Cromer Gas Bill, Drogheda Gas Bill, Frodingham Gas Bill, East Ham Improvement Bill, Hartlepool Gas and Water Bill, Haslemere District Water and Gas Bill, Keighley Corporation Bill, Maldon Water Bill, Matlock Urban District Council Bill, Mid-Kent Water Bill, Northam Urban District Water Bill, North Warwickshire Water Bill, Paignton Improvement Bill, Rhymney and Aber Valleys Gas and Water Bill, St. Anne's-on-the-Sea Gas Bill, St. Helens Corporation Bill, Southampton Gas Bill, Southend-on-Sea Gas Bill, Southend Water Bill, Southwark and Vauxhall Water Bill, Staines Reservoirs Joint Committee Bill, Thanet Gas Bill, Tottenham and Edmonton Gas Bill, Wey Valley Water Bill, Whitwick and Coalville Gas Bill, Wymondham Water Bill.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Feb. 22.

(*Before Mr. Justice* NORTH.)

Livesey v. The Patent Gas Enrichment Syndicate, Limited, and Others.

This was a motion for an injunction to restrain the defendants from publishing, printing, circulating, divulging, or parting with certain letters written by the plaintiff.

Mr. H. TERRELL, Q.C., who appeared with Mr. CANN for the plaintiff, having opened the motion,

Mr. SWINFEN EADY, Q.C., who, with Mr. MICKLEM, represented the defendants, said the matter had already come before Mr. Justice Romer (*ante*, p. 285), when an undertaking was given not to further publish the letter of Mr. Livesey, which had given rise to the proceedings. He should point out, however, that Mr. Livesey wrote a second letter to the defendants, in which he said they might use the first letter if they wished it, but if so it must be printed entirely—no extracts being taken; and what had been done was to set out both letters verbatim in the prospectus. A hundred thousand of these had been printed, and the great majority of them were distributed—only a few thousand remaining. It was idle to talk of not divulging the contents of a letter which had been circulated broadcast in that way. Having given a licence for the publication, the plaintiff now sought to withdraw it; and the defendants having gone to great expense with regard to printing the prospectus, there might be a question as to the plaintiff's liability in damages. Of course, this would be a matter for the trial; and, in the meantime, he would undertake not to make any further use of the letters until then, on the plaintiff giving an undertaking in damages.

Mr. TERRELL said he should also ask for an undertaking not to distribute any prospectus or circular bearing the name of the plaintiff; because it was not of the letters only that he complained. They put his name on the prospectus in very large characters, he being a man of great eminence in the gas world; and they were anxious to make it appear that he was connected with the Syndicate.

Justice NORTH said if they published any further copies of the prospectus, after the undertaking, the letters would not appear on them.

Mr. TERRELL suggested that they might say that Mr. Livesey had written letters in favour of the plan, or something of that kind. So long as they did not in any way connect his name with the concern, that was all he cared about.

Justice NORTH remarked that he did not think there was any right to that.

Mr. TERRELL said it appeared by the evidence that people had been led to believe that Mr. Livesey was associated with the Syndicate. That was the object of it. There was a statement to the effect that Mr. George Livesey and hundreds of other high authorities connected with gas undertakings appreciated, and would be prepared to accept, the advantages offered by the plant in question. This was not true. Mr. Livesey did not appreciate, and was not prepared to accept, these advantages.

Justice NORTH said this referred to plaintiff having written the letters. He did not know that he had any right to say that the Syndicate should not, under any circumstances, mention the name of an individual at all. He thought the undertaking given was all that could be required. If they used his name in the prospectus by way of a gross libel upon him, he could not prevent it by injunction; and if it were not a libel, he did not see that he had any more power than if it was.

After some further discussion, the motion was ordered to stand over till the trial; the defendants, and also Mr. Fenwick and Mr. Pugh, not to publish, print, or circulate the two letters of the plaintiff dated Aug. 5 and Sept. 1, 1897, or any parts thereof, and the plaintiff giving an undertaking in damages.

The Incandescent Gas-Light Company's Patents.

In the Chancery Division of the High Court of Justice last Thursday, before Mr. Justice Romer, Mr. Walter applied for an injunction to restrain one Brogden, residing at No. 18, Croft Terrace, South Shields, from infringing the patents of the Incandescent Gas-Light Company, Limited. No defence had been put in; and his Lordship made the usual order.

MISCELLANEOUS NEWS.

THE LONDON COUNTY COUNCIL AND THE GASLIGHT AND COKE COMPANY'S BILL.

The Bill to be Opposed.

At the Meeting of the London County Council last Tuesday—Dr. COLLINS in the chair—the subject of the Bill promoted by The Gaslight and Coke Company to enable them to consolidate and convert their stocks, was under consideration. As already mentioned in our editorial columns, the Parliamentary Committee of the Council had recommended that the Bill should be opposed; and as they had been advised that this could only be done by proceeding under the provisions of the Borough Funds Act, 1872, they asked the Council to approve of the steps they had taken in the matter, and to sanction the opposition, and the charging of the expenses upon the county fund.

Mr. M'KINNON WOOD, the Chairman of the Committee, moved that a petition against the Bill be sealed and presented. He referred to the history of the matter, and said the Committee were of opinion that the system of finance proposed was unsatisfactory. They did not merely oppose the Bill because, in the event of purchase, the price would be enormously increased. When the Progressives desired to oppose the Bill of the South Metropolitan Gas Company for the conversion of their stock, they did not obtain an absolute majority of the whole Council; but in that case the Comptroller of the Council told them that the result of the conversion would be an increase of the Stock Exchange value of the undertaking by £250,000. Mr. Livesey had put it at £90,000; but the actual effect had been an increase in capital values of £900,000. This gave weight to the Comptroller's calculations in the case of The Gaslight and Coke Company—that the proposed conversion would increase the capital value by £1,000,000. It might be argued that this was no business of theirs, and that they had no right to interfere with private enterprise. It was evident, however, from the action of Parliament, that gas companies were not regarded as wholly of a private nature, but that the interest of the consumers had to be considered, or else why should they sanction the creation of the sliding-scale? The point he wished to enforce was that it would make a great difference in the mind of Parliament whether the Company were paying 12¾ per cent. at a certain charge for gas, or a little over 5 per cent., as would be the case if the conversion were allowed to pass, because what the Company were going to do was to turn the 10 per cent. standard dividend into one of 4 per cent., and then the adjustment of the sliding-scale would be made in proportion to the dividend. The difference would be that, though it might seem fair to members of Parliament—and not all members of Parliament were financiers—to make a concession to consumers on a 12¾ per cent. dividend, it would not do so when the dividend was only 5 per cent.

Mr. BENN seconded the resolution.

The Earl of ONSLOW said he wished to move, as an addition to the resolution, the words "it being the opinion of the Council that no concession should in any case be made to the Company unless accompanied by some concession to the consumers of gas." He said that in the South Metropolitan Company's Bill of 1895 no concession was made to the public; but in the Bill of the following year there was one, by giving employees an opportunity of acquiring stock.

Mr. M'KINNON WOOD remarked that the petition fully safeguarded the interests of the consumers.

The CHAIRMAN ruled the amendment out of order, on the ground that the resolution was a statutory one.

Mr. BEACHCROFT said there was considerable difference between the case of the South Metropolitan Gas Company and that of The Gaslight and Coke Company. In the former, Mr. Livesey came before the Committee and undertook to make certain concessions to the workmen of his Company in the direction of inducing them to become shareholders in the concern. This no doubt considerably influenced the Council. In the present case no concession was offered. The Gaslight and Coke Company had grossly mismanaged their business; and he earnestly hoped that both sides of the Council would join hands and show by their unanimous vote that they did not intend to allow the Company to obtain any further advantages unless they were prepared to give equal advantages to the gas consumers.

Sir T. G. FARDELL, M.P., observed that the Bill was the most impudent proposition that had ever been brought forward by a public Company. There was absolutely nothing to justify it; and the interests of the public were entirely ignored.

On a show of hands, only three or four were held up in opposition to the resolution. The Progressives, however, pressed for a division, and put forward the Rev. F. Williams and Mr. Lyon as tellers. The votes of these members were therefore lost, and counted on the other side. The other two voting in the minority were Mr. E. Bond, M.P., and Mr. W. H. Fox, representing Hampstead and North Kensington respectively. The numbers were: For the motion, 101; against it, 4—majority, 97. It was accordingly carried.

NEWCASTLE AND GATESHEAD GAS COMPANY.

The Annual General Meeting of this Company was held on Wednesday last—Dr. L. W. ADAMSON (in the absence, through indisposition, of Mr. W. B. Wilkinson, the Chairman of the Company) presiding.

The report of the Directors, noticed in the "JOURNAL" last week (p. 416), having been taken as read,

The CHAIRMAN, in moving its adoption, said that, in addition to the reserve fund, they had carried forward on the present occasion, for 1898, £3082. The accounts were so far unsatisfactory that the sums hitherto realized for residuals had fallen to a lamentable point. With regard to coke, while paying at the same rate for coals as they did in 1896, the price obtained for coke was much less than they realized in the previous year. This made a very material difference in the accounts, amounting to £5344. With regard to tar, the matter was still more startling. On this item, between 1896 and 1897, the difference, supposing they sold the same quantity, was £5105. On the two items of coke and tar, therefore, with coal at precisely the same figure as they paid in 1896, the Company lost £10,449. This, of course, was a very serious item, and one to be very much regretted; but it was absolutely beyond their control. With regard to sulphate of ammonia, again, the price in May last fell to the lowest point on record—£7 8s. 9d. per ton; and though the price had gradually risen till it was £9 1s. 4d. in December, the benefit of the rise could not be taken into account in the balance-sheet now before the meeting. The price was still slightly rising, and they hoped that it would be maintained in the current year. Then in the early part of last year there was a very substantial increase in the make of gas. They made 144,495,000 cubic feet more in the first six months of 1897 than in the corresponding period of 1896. It was a matter of notoriety that half the works in their district had been in a state of paralysis owing to the prolonged strike in the engineering trade. They might find it difficult to ascertain just why or how this affected them; but a very large quantity of the gas they made was supplied for motive power, and instead of maintaining the rate of progress relatively that they had been doing, they absolutely decreased the make of gas in the latter half of 1897, as compared with 1896, by 10,114,000 cubic feet. This was attributable to the existence of the engineers' strike, and to the mild season. With regard to the price of gas, he would simply draw attention to one fact, which was that their gas was probably the lowest in price of any in the kingdom. Their stock had materially increased in value; and they hoped that in the future they would still show the progress that had distinguished their undertaking in years past. They had been making large extensions. The new works at Redheugh would enable them to make 10 million cubic feet of gas per day—a very material addition to their present power. At St. Anthony's, they had possession of land on which they proposed to erect the new works for which they obtained parliamentary powers two years ago. There would be a gasholder capable of containing 5 million cubic feet. On mains, some £20,000 had been spent in meeting the demands of the outlying portions of the town, now rapidly being built upon. At last, through the consideration shown by one of the representatives of the Amalgamated Union of Labour—a man with whom they had always got on well—they had arranged the basis of a Conciliation Board with their workmen. They hoped that this would have the effect of ensuring peace in the government of their works, and that all questions in dispute would be amicably settled without the wearying, prostrating, paralyzing action of a strike or lock-out. They had succeeded in getting quotations for the whole of their stocks upon the London Stock Exchange. Mr. Adamson referred to the changes in the office arrangements, and congratulated Mr. Waddom, the Secretary, on the way they had been devised and carried out.

Mr. ARMSTRONG seconded the motion, and it was carried.

The dividends recommended were declared; and the proceedings closed with a vote of thanks to the Chairman.

PLYMOUTH AND STONEHOUSE GAS COMPANY.

Extension of the Area of Supply—Issue of Further Capital—The Recent Litigation.

An Extraordinary Meeting of the shareholders in the above-named Company was held last Tuesday, to consider the provisions of the Bill which the Company are promoting in the present session. Mr. GEORGE HENDERSON presided.

The CHAIRMAN explained that this was a statutory meeting, and said the Directors had thought it would be desirable to convert the share capital which was authorized by the Acts of 1855 and 1879 into 5 per cent. ordinary stock like the rest of the capital; and they had applied for power to carry this out. The dividend on the 1855 shares was now 9¾ per cent.; and on the 1879 shares, 9¼ per cent. It was found very difficult to give the same proportion of 5 per cent. stock to represent the dividend the shareholders now received. The Directors ascertained that there would be a loss of 1s. 1d. per share on the 1855 shares, and of 1s. 3d. each on the 1879 shares; and, after due consideration, and in the interests of the Company, they had decided to abandon this part of the Bill, because they did not think it fair or consistent to deprive the shareholders of the full extent of dividend now received under the sliding-scale. If the alteration were made, it would deprive shareholders of something like £600 on the different classes of stock; and this would be serious.

Mr. J. SHELLY, the Solicitor to the Company, explained the clauses of the Bill; one of the objects of which was to authorize the purchase of Mr. Ward's tannery adjoining the gas-works, which had given rise to litigation. Having furnished details of these proceedings, he went on to say that the finding of the Official Referee completely justified the Company. But although it discharged Mr. Ward's application, it left the Company still subject to the injunction previously obtained; and in case of fresh annoyance, he might institute further proceedings. This was brought to the consideration of the Directors, and, on the advice of Mr. Channell (now Mr. Justice Channell) and Mr. H. E. Duke, they asked Mr. Ward if he was disposed to sell his property to the Company. The result of the negotiations was that they agreed upon terms; and, subject to confirmation by Parliament, they would become the owners of the tannery. The Bill also dealt with the area for the supply of gas. The boundary of the borough of Plymouth had been considerably extended in recent years; and as the powers of the Company only authorized the supply of gas within the limits of the old borough, the Directors had thought it wise to make the area of supply co-extensive with the enlarged district, and taking in, for lighting purposes, the parishes of Egg Buckland and Tamerton Foliot, and the tithings of Compton Gifford and Pennycross.

The CHAIRMAN moved that the Bill be approved, except so much thereof as related to the consolidation of the existing capital.

The VICE-CHAIRMAN (Mr. J. A. Bellamy) seconded the motion.

Mr. R. WOOLLAND asked whether the amount to be paid to Mr. Ward would be in satisfaction of all claims past and prospective.

The CHAIRMAN: Yes.

Mr. R. SMITH thought an effort should be made to get a quotation for Plymouth gas stock on the London Stock Exchange.

The motion was then carried.

A second meeting was immediately held to sanction, under the provisions of the Plymouth and Stonehouse Gas Act, 1894, the issue of further capital to the amount of £20,000 of ordinary stock.

The CHAIRMAN explained that the Act authorized the Company to raise £80,000 of 5 per cent. ordinary stock, of which £30,000 might be issued in 1894, and £10,000 in each of the following years. They might, therefore, have issued the whole of the stock by this time; but while Mr. Ward's action was in abeyance, they decided not to take any steps under these powers. In the meantime, they had had no difficulty in getting any amount they required from the bank. This arrangement had been advantageous, as the rate of interest paid was less than the dividend they would have to pay upon the stock when issued. They had £57,500 remaining of the capital authorized by the Act of 1894; and the proprietors had power to sanction the issue of £20,000 of the balance. At the last annual meeting of the Company, the Directors were authorized to raise £10,000, which would be done shortly; and this would bring the total up to £30,000. Upon this they expected to realize about £15,000 premiums; making altogether £45,000. Their liabilities were rather heavy. They included the purchase of Mr. Ward's works, and the costs of that transaction. A carburetted water-gas plant was also being erected. One section was complete; and the Directors were of opinion that it would be of great benefit, and effect a considerable saving. He concluded by moving the formal resolution authorizing the necessary steps for the issue of the stock.

Mr. BELLAMY seconded the motion, and it was carried.

The CHAIRMAN referred to the past success of the Company, and said he believed this success would continue. For some years they had been in the position of selling gas at a lower price than any other company in England. This was a great advantage to the consumers; and they all hoped it would continue. The Gaslight and Coke Company—the largest gas undertaking in the world—were going to raise their price in order to maintain their dividends. The Plymouth Company were not in this position. They had a good reserve, and, in addition, the sum of £12,000 of undivided profits, which would enable them to pay their maximum dividends for a long time to come.

On the motion of Mr. WOOLLAND, seconded by Mr. W. J. C. HANNAFORD, the Directors and Messrs. Shelly and Johns, the Company's Solicitors, were thanked for the able manner in which they had conducted the case for the Company in the litigation with Mr. Ward.

The proceedings then terminated.

TOTTENHAM AND EDMONTON GAS COMPANY.

A Progressive Business—Fate of the Electric Lighting Clauses in the Company's Bill—Striking Figures as to the Prepayment Meter System.

The Half-Yearly Meeting of the above Company was held last Saturday, at the Offices, Willoughby Lane, Tottenham—Mr. CORBET WOODALL in the chair.

The SECRETARY (Mr. James Randall) having read the notice convening the meeting, the report and accounts—to which reference was made last week—were submitted.

The CHAIRMAN, in moving their adoption, said the past half year had been one of steady and satisfactory progress. Both in income and profit, they showed an improved position as compared with this time last year. The increase in the gas sold had been from 230 to 245 million cubic feet, or 15 millions on the half year. The increase of the gas revenue had been from £34,000 to £36,700. He thought it was well to take a review extending a little farther than one year. Comparing their position with ten years ago, he found that the consumption of gas had advanced by 110 million cubic feet, or 80 per cent. He would ask the shareholders to specially notice these percentages. The income from gas had increased by £14,000, or 62 per cent.; while the amount they had divided as dividend and interest on capital had increased by £3500, or at the rate of 55 per cent. Within the same period, the price of gas had been reduced by something like 12 per cent. He thought this statement of percentages was instructive and very encouraging. The increase in the business had been 80 per cent.; but the cost of this increase to the consumers (because after all they had to look to the consumers for their dividends) had been only 55 per cent. upon what it was prior to ten years ago. This showed: First, that the capital had been wisely and judiciously spent; and, secondly, that the charges for capital were less now than in the earlier days. They also showed conclusively, he thought, that, to a large extent, the consumers of gas to-day were participants with the shareholders in any improvement that could be made in the process of manufacture or in the methods of management; and that, consequently, they were not, as they used to be in the days gone by, so keenly interested as to the amount of capital that the Company were authorized to raise, or any other question affecting the capital account. The capital had grown rather rapidly in recent years. It was a mistake to suppose that because the business of the Company was growing, and larger works had to be built, that these larger works could be provided at less cost than used to be the case in the old days. According to usual experience, the bigger the thing, the cheaper proportionally it should be. It was hardly so in the case of gas-works. Their apparatus was becoming very costly. The installations of retorts were far more costly per unit than they were (say) fifteen years ago. The introduction of machinery had added materially to the capital account. The very large increase in the size of the purifiers, and in the attention given to methods of purification, also added to the necessary capital expenditure in these directions. Then the greatly enlarged mains, and the facilities they were affording to the poorer class of the community to enjoy the use of gas without having to provide the capital required to put pipes and fittings in their houses, all tended to make the expenditure per unit of gas sold heavier rather than lighter. But the advantage to the Company should be found not in the reduction in the amount of the capital, but in the reduction of the working expenses which ought to result from the improved appliances to which he had referred. There was one thing that he could assure the proprietors absolutely—that was, the Board were keenly alive to the necessity of keeping down the capital expenditure as much as possible. He could promise them this, that no sum that was spent by the Board should find its way to the capital account if it could fairly and properly be charged against the revenue account. They watched most jealously that the revenue bore its full share of the burdens of the Company. He was glad to call attention to the fact that, in the past half year, the expenditure on maintenance and repair of works and plant was £2860, as compared with £2060 in the corresponding half of 1896; while the expenditure on mains was about £150 more. It was easy enough to be virtuous in this direction when they had a balance-sheet such as he had to introduce to the proprietors that day—one that gave them money enough with which to treat these matters in the way he had been saying was the only right and legitimate way of dealing with them. But they would not be seduced from the path of virtue even though in years to come, the balance was not quite so flourishing as it was on this occasion. In the course of the coming year, as mentioned in the report, it would be necessary to expend a large sum in making considerable alterations in their largest retort-house, and in rebuilding the retort-benches. He was not at present prepared to say what the amount of this expenditure would be. It would, however, be a large sum, and would be almost entirely a charge against revenue. They could not possibly arrange so that each half year bore just the same proportion of expenditure of this kind; but they did try, as far as they could, to equalize it. As the proposed expenditure would be more than one year would be able to bear, the Directors would probably form a suspense account, and carry some of it forward for possibly another year or so. In the course of this reconstruction, they were going to introduce mechanical appliances for operating the retorts. He knew of no manufacture in which machinery could be more appropriately and profitably employed than in this particular one. He had said a few words on the question of the amount of the expenditure on capital account, and he had said that the Directors did their utmost to keep the expenditure low. He might add that in no direction, in his opinion, could gas companies more profitably expend their energies than in watching the capital expenditure. Although it was becoming a commonplace at their meetings because they had spoken of it frequently, it was worth repeating (seeing how little it was understood outside) how completely the interests of the shareholders in gas companies were identical with the interests of the gas consumers in this keeping down of the capital, and of the charges consequent upon capital. He did not think there was anything further upon the accounts to which he need refer; but the proprietors would perhaps wish him to say a few words with regard to the Bill which was now pending before Parliament. He had to tell them that, since their Wharncliffe meeting, they had practically resolved to withdraw the electric lighting clauses from the Bill. This was not because of any change of opinion on the part of the Board, but because they found that, in the first place, the Chairman of Committees of the Lords objected to the Company proceeding by means of a Bill for this purpose, on the ground that this legislation had hitherto been entirely in the hands of the Board of Trade, and he was not prepared to take upon his shoulders the burden that had been so well borne by the Board of Trade up to this time. In company with the Solicitor, he (Mr. Woodall) saw the Board of Trade, and talked the matter over with them, and found they, too, thought it would be to the public advantage that they should continue to entirely control legislation with regard to electric lighting. He might mention that he asked whether they were to understand that it was upon general principles, and not upon the question of the supply of electricity by gas companies, that their decision was based; and they said entirely so. They also promised him that if, in the course of July, the Company chose to promote a Provisional Order for the purpose of doing exactly the same work, they would find sympathetic treatment on their part. Under these circumstances, the Directors felt that the only right and respectful course to pursue was to withdraw the detail clauses from the Bill, and confine themselves to taking power to use the money raised under the Bill for the purposes of electric lighting in the event of their obtaining a Provisional Order. He was glad to repeat what he said a few weeks ago, that one result of this talk over the preparations for their Bill had been to further improve the relations between the Company and the Local Authorities in whose districts they carried on their business. The negotiations they had had with them had been uniformly pleasant and satisfactory; and if they continued so, and the Local Authorities were still of the same view as the Directors as to the advantages that would accrue to the districts from the Company taking up electric lighting, he thought he might say definitely that the Board would advise the proprietors in July to promote an Order. They recognized most fully the fact that they, as a Company, had obligations put upon them by their parliamentary position that they must live up to—that they were not simply a Company to earn dividends for the shareholders, but a Company to carry out certain public duties, and do them in a proper way. So long as this spirit (which he need not remind the proprietors was a cardinal point in the policy of their late respected Chairman, Mr. Gripper) continued to guide the Directors of the Company, they would go on harmoniously and prosperously fulfilling the duties they had undertaken.

Sir HENRY CARTWRIGHT seconded the motion, which was unanimously carried.

Mr. D. FORD GODDARD, M.P., proposed the declaration of dividends at the rates of 12 per cent. per annum on the "A" stock, and of 9 per cent. on the "B" and "C" stocks, both less income-tax.

Mr. H. BAILEY seconded the proposition, which was agreed to.

Mr. JOHN RANDALL said the Chairman had called attention to the increase that had taken place in the business during the past ten years; but he should like to go back a year or two farther. In 1885, the capital was £115,000; while now it was £240,000. In 1885, the consumption of gas was 235 million cubic feet; and in 1897, about 460 millions. During this period no increase had been made in the Directors' remuneration; and he thought the proprietors would admit that some acknowledgment should be made of the increasing responsibilities of the Directors, and of the skill and care they devoted to the conduct of the business. He therefore had pleasure in moving that the remuneration of the Directors be increased from £1000 to £1200 as from Jan. 1 last.

Mr. C. F. WARDELL seconded the proposition.

Mr. G. T. WATSON, in support, said this was a graceful, if slight, recognition of the eminent services their Chairman had rendered to the Company since he had been on the Board. Notwithstanding the many calls on his time, he devoted himself ungrudgingly to their interests.

The motion was carried unanimously.

The CHAIRMAN said he hesitated somewhat as to what was his duty before this resolution was put; but he felt it would have been ungracious to have said a word until the vote was taken. Before he arrived there that day, he did not know there was any intention to make this proposal; and he could assure the proprietors that, while he valued very much every evidence of their confidence in the Board, they were far from desiring this substantial recognition of such services as they were able to render to the Company. He could say that now, as in the days of Mr. Gripper, it was not only a duty, but a pleasure, to the members of the Board to do what they could to maintain the prosperity of the concern.

On the motion of Mr. W. S. WRIGLEY, seconded by Mr. R. S. GARDINER, a vote of thanks was passed to the Chairman and Directors and to the Secretary (Mr. James Randall), the Engineer (Mr. W. H. H. Broadberry), their assistants, and staffs.

The CHAIRMAN said it might interest the proprietors if he gave them, before separating, a few figures regarding the comparatively new development of their business—that was, the prepayment meter system. It was commenced in August, 1893; so that they had had four full years' experience of the system. At the end of 1893, they had 68 of these meters in use. The number rose year by year to 1250, 2658, 4323, and by the end of 1897 to 5740. More satisfactory to his mind than this growth in the number was the increase in the average returns coming from these meters. The average revenue per consumer in 1894 was £1 4s. 11d.; in 1895, £1 16s. 5d.; in 1896, £1 17s. 3d.; and in 1897, £2 2s. 1d. The total amount of revenue derived from these meters in 1897 (nearly the whole of which was in coppers) was £12,086. The importance of this side of their business would be apparent when he told the proprietors that, while they had now 5740 prepayment meters in use, the ordinary ones numbered 6512. It would therefore be seen that the prepayment meters were rapidly overtaking the ordinary ones. In four years the ordinary had increased by 1200, and the prepayment, by 5680.

The proceedings then terminated.

CROYDON COMMERCIAL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday, at the Offices, Katherine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. J. Russell) having read the notice convening the meeting, the report and accounts, which were summarized last week, were presented.

The CHAIRMAN, in moving their adoption, said the first point he would touch upon was that of the increase in the sale of gas. For reasons which he thought he should be able to satisfactorily explain, the increase had unfortunately been much smaller than he had had the pleasure of reporting on many previous occasions. It only amounted to 1·33 per cent. compared with the corresponding period of 1896. For the cause of this, they had not to look far. During the half year, the weather had been exceptionally mild—the days had been bright and the temperature high, which, while very pleasant for them personally, was not conducive to an enlarged consumption of gas. Other gas companies had suffered in much the same way. To show that the reason he had given was a reliable one, he might say that during the previous two days, when a lower temperature prevailed, they had had an increase of ¾ million cubic feet in the consumption of gas compared with the corresponding days of 1897. He thought this conclusively proved that the decrease in their rate of progress in the half year was really due to the weather. At the same time, he could not deny that they had had a slight check through the electric light, which had been adopted somewhat extensively in the district. But he thought he might say, without fear of contradiction, that the increase in their prepayment meters alone was sufficient to counterbalance the increased use of the electric light. From the sale of gas in the half year, they had received £43,513; but the market for residual products was still in a very bad state. On tar there had been a serious decrease; and, had it not been for that residual, they would have been in a much better position. Fortunately, however, sulphate of ammonia had improved very much; and they hoped that, when farmers appreciated what a valuable manure it was, it would rise to a better price still. The Company were doing what they could in this direction by joining a Committee which had been formed for the purpose of making the value of sulphate better known; and they hoped the movement would have good results. At the close of December, they had 12,034 gas consumers on their books, without taking into account the public lighting. An additional 428 houses had been fitted up on the prepayment meter system; and 440 cooking and heating stoves had been supplied—making a total of 3305 prepayment meters, and 4570 stoves. During the half year, they had put down a complete plant for the manufacture of carburetted water gas; and it had been in use for about six weeks. Before they adopted the system, the Directors made themselves thoroughly acquainted with what it was able to do, and the benefits the Company would derive from its use. Their Engineer (Mr. J. W. Helps) brought it to their notice; and they then went and saw the plants which had been put down at the Brighton and Birmingham Gas-Works. At Brighton, the Engineer (Mr. Cash) told them of the great benefits his Company had derived from the system. At Birmingham, the Engineer stated that he would not be without the plant for anything, and that he was going to recommend his Committee to double it. This had been done since the visit of the Directors. The Board had also had the advantage of the experience in this matter of one of their colleagues (Mr. Corbet Woodall), who was connected with gas-works where the system had been in use for a considerable period. If the proprietors would turn to the capital account, they would see that in the half year £16,372 had been expended, of which £12,990 had been spent in putting up the water-gas plant. Mr. Helps, who designed it and supervised its erection, had been complimented by the makers, who said it was one of the most complete plants in the kingdom. It had also been inspected by several gas engineers, who had likewise congratulated him on its successful working. There were many reasons which induced the Directors to go in for this apparatus. The first was that they had only a certain amount of space left at the works on which they could erect coal carbonizing plant; and they wanted to economize it as much as possible. It might astonish some of the proprietors to learn that the apparatus for manufacturing carburetted water gas only occupied about one-third of the space that would be required for the retorts necessary to produce the same amount of coal gas. The second advantage was the rapidity with which the plant could be set to work as compared with the delay that occurred under the old system; and the third benefit was that it enabled them to profitably employ a large quantity of coke, which residual had in times past been a source of trouble to the Directors. The large quantity which they made, and the difficulty of getting rid of it, had been the means of reducing the price, because they could not store more than a certain quantity, and it was not wise or economical to do so. They would therefore now be able to regulate their coke market very much more than in the past. With regard to the financial results of the half year, the Directors were in the position of being able to propose the usual dividends without drawing on the reserve fund. In this respect they were in a much happier state than several other gas companies. One large company had had to draw about £74,000 out of their reserve fund, and a neighbouring company about £4500, in order to pay their dividends. He was glad to say they had not had to do this, but had sufficient to pay the dividends, and to carry forward a small balance. He should like to mention that out of a revenue of £43,513 for gas and £11,974 for residuals, they had only incurred a loss of £53 14s. 10d. in bad debts, which he thought spoke volumes as to the manner in which the collectors did their work.

The DEPUTY-CHAIRMAN (Mr. A. J. Lambert) seconded the motion.

Mr. DALZIEL, referring to the capital account, said it seemed to him to be increasing very rapidly. In 1894, the capital amounted to £263,000; while in December last, it was £365,000 or an increase of £102,000. In the second half of 1894, the net revenue was £13,599, as compared with £14,888 in the past six months, which was an advance of only £1289. This was a paltry increase for such a large additional expenditure of capital. He would suggest that they should close the capital account. It appeared to him that they were driving on far too rapidly; and they could not stand it much longer. They only carried forward £53; and this was a small amount with which to meet the dividend on the extra outlay. If they did not stop the capital account, he felt sure they would get into the same state as those companies who had had to draw to such a large extent on their reserve funds.

The CHAIRMAN replied that one of the surest tests a gas company could possibly have in this matter was the amount of capital expended per ton of coal carbonized. In 1884, when Mr. Helps became their Engineer and Manager, the capital was equal to £8 per ton of coal carbonized; while now it was only £5 15s. This he thought very satisfactory; and it would be apparent to the proprietors that it was so when he compared it with other companies. In the case of the Brentford Company, the capital per ton was £6 14s. 7d.; Bromley, £8 2s. 10d.; Gaslight and Coke Company, £6 3s. 2d.; Reading, £6; and Richmond, £5 18s. 5d. The average for all the Suburban Companies was £5 18s., as against their own £5 15s. It was very clear they were not going far wrong when they could show such comparisons as this.

The motion was unanimously carried.

Mr. CORBET WOODALL proposed the declaration of dividends at the rates of 14 per cent. per annum on the "A" stock, 11 per cent. on the "B" stock, and 9 per cent. on the "C" and Carshalton capital. He remarked that he thought the proposing of such dividends as these was the best possible reply to the criticism Mr. Dalziel had made. That gentleman had referred to their having only the small balance of £53 to carry forward. Apparently he had altogether lost sight of the fact that these dividends were paid upon the whole of the capital of the Company, including that which had been raised in recent years for the purpose of carrying out the various extensions. If the honourable proprietor would permit him to say so, the idea of closing the capital account was rather an amusing one. They had been used, within the last few years, to increases in their business of 10 and 12 per cent. per annum; and did they hope they were going to stop these increases? Surely not. The more they came to, the better pleased the Directors would be. It was true that out of the new capital raised, the shareholders received hardly any advantage; nearly the whole of it went to the consumers. It was the desire of the Directors that as much of the gain as was due to improved management or cheaper capital should go to the consumers. It was their great wish to reduce the price of gas as far as possible, and thereby to consolidate the position of the Company. In the period to which Mr. Dalziel had referred, they had lowered the price of gas by 2d. per 1000 cubic feet, which represented about £4000 per annum. For his own part (although he believed he was somewhat of a heretic in this respect), he had not the least objection to drawing on the reserve fund if necessary to make up the dividend in a year of special stress, as the past year had been. They indeed rejoiced that they had not had to do it; and they sympathized with those of their neighbours who had not been so fortunate.

Mr. T. RIGBY seconded the motion, which was unanimously carried.

The outgoing Directors (Messrs. C. Hussey and Samuel Spencer) and Auditor (Mr. J. C. Benwell) having been re-elected,

Alderman LAYTON proposed, and Dr. THOMPSON seconded, a vote of thanks to the Chairman and Directors.

The CHAIRMAN, having acknowledged the compliment, moved a similar vote to the Secretary and the Engineer, and their respective staffs.

Mr. G. J. B. JACKSON seconded the motion, which was heartily agreed to.

Mr. RUSSELL having sincerely thanked the shareholders on behalf of himself and staff,

Mr. HELPS also responded. In doing so, he supplemented, at the request of the Chairman, the information he had given respecting the carburetted water-gas plant. He said the new apparatus was capable of producing 1,300,000 cubic feet of water gas per day; but at present they had only half of it at work, which meant they were making something like 650,000 cubic feet per day. For this they used about 12 tons of coke; but the saving did not stop there. If they were carbonizing the coal necessary to manufacture the quantity of gas they were making by the carburetted water-gas plant, they would produce a further 30 or 32 tons of coke; so that they were enabled to take off the market something like 44 tons of coke a day. Should they use the plant to any greater extent than they were doing at present, the saving would go on in the same ratio. He thought the shareholders would agree that the money expended on this plant had not been thrown away, but that it had been spent in a direction that would be advantageous to both the Company and the consumers.

This concluded the proceedings.

BROMLEY GAS CONSUMERS' COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held on Thursday, at the White Hart Hotel, Bromley—Mr. ALEX. DICKSON in the chair.

The SECRETARY (Mr. H. W. Amos) having read the notice convening the meeting, the report and accounts, the principal figures of which were given in the "JOURNAL" a fortnight ago, were presented.

The CHAIRMAN, in moving the adoption of the report and accounts, pointed out that the make of gas showed an increase of 8 million cubic feet over the previous half year. This was more than a million cubic feet in excess of the corresponding period of the previous year; while the December half of 1896 showed an increase of 12 million cubic feet over the December half of 1895. On that occasion he thought that, instead of taking the congratulations to themselves, they had to tender them to their consumers, in view of the saving which had been effected to them owing to the many bright and sunny days, and the prolongation of the unusually mild temperature which characterized the closing months of last year. Putting it into money, he supposed the saving effected by those favourable conditions to the consumers generally had been not less than £1500. Of course, the Company had to be adequately prepared to meet the ordinarily increased consumption of the half year; but this had been postponed, apparently, until next winter. He was pleased at the same time to state that the works were not only capable of making the increased quantity which the return of an ordinary English winter would entail, but a further amount which would be adequate to any possible developments in the town for many years to come. The manufacture of gas had been slightly improved during the half year, inasmuch as less coal was used and an increased quantity of gas made; but the residuals continued to disappoint them. Coke had not sold freely; and tar had also been of less value generally. A slight improvement had been encountered in the sulphate of ammonia business. Those who observed the arrangements of the town would have noticed that during the past year some very interesting and valuable experiments had been made in street lighting, with the co-operation of the Local Authority; and he thought they might claim that these experiments had shown that, with modern lanterns and burners, the steadiest, most effective, and therefore the cheapest light could be obtained. They had been very pleased to make the experiments; and they proved what was possible if a sufficient outlay was made. The result of the recent sale of shares afforded every satisfaction, inasmuch as without any alteration in the rate of dividend the average price realized was £22 per share—the highest ever reached, and equivalent to an advance of £2 10s. per share in the two years since the last sale. At this price the return was a little under 4 per cent. It was the most economical issue of capital they had ever been able to effect. Another gratifying feature to be recognized in the results of the sale was the public confidence shown in the Company by the very large demand for the shares when offered; they could have sold many more had they wished to do so. This was pleasing at a time when rumour told them that the Urban Council were about to part with their rights in a Provisional Order for electric lighting to some company. Whether that company was a local one or otherwise was a matter of indifference. If there were any real remunerative demand for electric light in the district, it was obvious that it would sooner or later be supplied either by that company or some other, if they (the Gas Company) were not to be allowed to enter the field, which appeared to be the case. Therefore the experiment might as well be made; and so far as they were concerned, they thought no harm whatever would come of it. They were quite prepared to meet every contingency which might arise in the advent of a competitor in the field for the lighting of the district. So long as they were able to supply a good gas at 3s. per 1000 cubic feet—which was just one-half of the cost of electric current, candle power for candle power, at 6d. per Board of Trade unit, while if the gas were burned on the incandescent system it was only one-tenth the cost of the electric current at 6d. per unit—and so long as they were able to offer to their consumers a reduction in price at the rate of 15s. out of every pound of additional profits they might make from all sources, they had no reason whatever to fear the advent of any electric lighting company. Contrasting the results of the year's trading with those of the previous year, he pointed out that last year their accounts gave them an increase in gas-rentals of £1270; they received from residuals another £303; and from fittings, £77—making altogether an increase of revenue of £1650. But they would see that the expenditure had been temporarily augmented, principally on account of the renewals and repairs which had been extensively made in the old retort-house, which had been vacant for some time. This house had been thoroughly renovated and re-set, and was perfectly ready to take its place in contributing to the manufacture. These renewals had cost £720 in excess in the expenditure under the heading of maintenance; and coals had required an extra £745, principally due to the rise in price which took place last year. Under the three headings of repairs to meters, services, fittings, &c., there had been another outlay of £325, which would prove very remunerative in regard to the maintenance of many of the Company's meters and other appliances in store for future use. On the other hand, labour cost less by £50; purifying materials, by £60; and their losses were less by £32. They therefore had a net result on the increased expenditure of £1832. Their revenue profits amounted to £13,461, and the payments on debenture interest to £1358; so that they closed the year with £383 to be carried forward. Having regard to the experiences of some of the very large gas companies, and of some of their more immediate neighbours, they were quite content that they had during the year earned their dividends and carried forward a small balance—more especially as they had made an exceptional outlay on renewals, which would prove of great value for future requirements. In concluding his remarks, the Chairman bore testimony to the very valuable services rendered by their able Engineer (Mr. Woodward), their Secretary (Mr. Amos), and the staff generally.

Mr. B. H. LATTER seconded the motion, and it was agreed to.

The CHAIRMAN, in reply to a shareholder who remarked that the accounts showed that they had not earned their dividends in the past half year by £161, said he was dealing with the figures for the whole year.

Mr. W. SUTTON suggested that new shares should be issued, instead of creating new debenture stock.

The CHAIRMAN observed that by the method proposed they were able to raise capital 1 per cent. cheaper. The debenture stock at 3½ per cent. was not distributed at par even to themselves, but realized a premium of about 14 per cent.; thus reducing the net cost by about 1 per cent.

A resolution was then passed authorizing the raising of £2500 by the creation of debenture stock.

The retiring Directors (Messrs. S. J. Wilde and F. H. Janson) and Auditor (Mr. W. W. Baynes) were re-elected; and votes of thanks to the Directors and the officers and staff brought the proceedings to a close.

HORNSEY GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Friday, at the Offices, 63, Chancery Lane, W.C.—Mr. W. P. BODKIN, J.P., in the chair.

The accounts for the six months ending Dec. 31 last showed a profit of £6395; and, after paying debenture interest, a balance of £10,650 remained.

The CHAIRMAN, in moving the adoption of the report and accounts, said that in the half year covered by them 117,993,500 cubic feet of gas had been sold for £18,038, as compared with 105,881,900 cubic feet supplied in the corresponding period of 1896 for £16,117—showing an increase of nearly 11½ per cent.; while the number of consumers had risen from 4662 to 5432. The Alexandra Palace was to be opened on Good Friday next; and though the electric light would be used, gas also would be required. The terms of supply had not yet been determined. There was a satisfactory increase from £619 to £695 in the rental of meters and stoves; and when it was seen that the income from residuals was £2483, as against £3032 in the corresponding period of 1896, the loss was not so great as appeared by these figures, because in making carburetted water gas they were consumers of coke to a considerable amount, and their coal bill was consequently smaller.

Mr. J. DREW, in seconding the motion, went into figures, showing the satisfactory results which had been obtained from the water-gas plant.

Mr. A. WARD complimented the Board on their management and on the resultant success.

The motion was carried unanimously.

Resolutions were passed for the payment of a dividend at the rate of 5 per cent. per annum on the preference shares, 11½ per cent. on the "A" shares, and 8½ per cent. on the other shares.

The retiring Directors and Auditor having been re-elected,

An extraordinary general meeting was held, at which power was given to the Directors to issue the remaining capital; but it was explained that only £5000 of 5 per cent. preference shares would be sold by auction by Mr. Alfred Richards early in April, and that the Board would consider when any further issue was contemplated so as not unnecessarily to increase the capital account. At the same time the Chairman stated that the extraordinary development of the district might be understood from the fact that forty new streets were being laid out and built upon, and that capital was required to meet the demands of an increased number of consumers.

A vote of thanks to the Chairman and Directors, as well as to the officers, brought the business to a close.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. JAMES GLAISHER, F.R.S., in the chair.

The SECRETARY (Mr. Alfred Lass, F.C.A.) read the notice convening the meeting; and the report and accounts were then submitted.

The CHAIRMAN, in moving their adoption, dealt first with the gas portion of the business. He said that in the half year the quantity of coal carbonized was 4150 tons, from which they had made 44,658,000 cubic feet of gas, or at the rate of 10,761 cubic feet per ton of coal. Such working, he was sure, must be satisfactory not only to the Engineer (Mr. T. H. Martin) but to every proprietor. The total amount of gas made was slightly in excess—219,000 cubic feet—of the corresponding period of 1896. This was easily accounted for by the mildness of the past season; and he was really delighted to find that they had an excess at all. The unaccounted-for gas was 2,518,000 cubic feet, which was at the rate of 5·64 per cent.; and considering the nature of the district supplied (with many miles of main on which there were but few lights), this was very satisfactory. The quantity of gas sold was 41,470,000 cubic feet; and so they had received money for 10,000 cubic feet per ton of coal carbonized, or for 93 per cent. of the total make. The gas used on the works amounted to about 670,000 cubic feet. As to the residuals, they made 3952 chaldrons of coke, or at the rate of 34 bushels per ton of coal carbonized. They sold 2879 chaldrons, at 8s. 4½d. per chaldron; and the quantity used in the manufacture and for engines, &c., was 1013 tons, so that nearly all the coke made was disposed of. Of tar, they made 43,575 gallons; being at the rate of 10½ gallons per ton of coal. The quantity sold was 37,182 gallons, at 1⅝d. per gallon. They made 113 chaldrons of breeze; and it was all sold. Of sulphate of ammonia, 41½ tons were produced; being an average of 1 ton for every 100 tons of coal carbonized. The cost of the gas was 24·79d. per 1000 cubic feet sold. These results were very gratifying; and they showed that every stoker had done his work well, and that the Manager's eye had been continuously in the retort-house. Turning to the receipts, he said that on the private lighting there had been an increase of £130. With the residuals, they had done pretty well—better than many other gas companies. They had had a small gain (£15 10s.) compared with the corresponding period of last year; while many companies with which he was acquainted showed a terrible *minus*. The total revenue of the gas undertaking was £10,071; being £156 more than for the December half of 1896. With reference to the expenditure, he had frequently spoken of the amount of money they had spent on the works to keep them in good order; and now they were having the advantage of this. The total expenditure last half year was £6376; being £240 less, so that the profits were £3694, or an increase of £397.

The water accounts were quite as, if not more, favourable than the gas accounts. The receipts for water totalled to £10,221; being an increase of £1025. The total expenditure was £3560, or £295 more than in the corresponding period of 1896; and the profit was £6660, or an increase of £731. Looking at the water capital account, it would be seen that an item of £19,043 had been inserted since the last meeting. This was the money expended on the Potter's Bar well, without giving them a satisfactory result. The Directors had water, but not in sufficient quantity; and therefore they had determined, under advice, to sink a well at East Barnet. They were now doing this; but it was a slow process. They first bored on the site of the well, and had had the water analyzed by Dr. Frankland. His report stated that it was a very pure water, and admirably fitted for dietetic purposes. With this assurance, they proceeded onwards, and were now driving a column of cylinders down the well from the surface to the chalk, so as not to allow any surface water or water from any strata between the surface and the chalk to enter the well. The Directors were doing their best in regard to the water supply; and, at whatever cost, they intended to have all the water that was required.

Mr. Charles Horsley seconded the motion.

Mr. George Anderson expressed his pleasure at seeing Mr. Glaisher still in the chair, and spoke of the many years that that gentleman had served the Company. He proceeded to remark that the carbonizing had been extremely well done. The residual products had returned them 56·3 per cent. of all they paid for coal. This was a very good result, and better than was usually the case in companies of similar dimensions. The previous week he received the accounts of another company in which he was interested; and he found their residual products only returned them 38·6 per cent. of the cost of the coal. Their Engineer was certainly entitled to the commendation of the whole body of shareholders. There was one point about which he (Mr. Anderson) was not quite sure. In looking at the gas accounts, he saw that the salaries of the Chief Engineer, superintendents, and officers at the works only came to £150 for the half year. It seemed to him that for a Company of their dimensions this was a small salary. He did not intend to move a resolution on the subject; but he wished to suggest to the Directors that, if the item referred to the Chief Engineer alone, it would not be too high.

The Chairman said he thought Mr. Anderson had taken the salaries in the gas accounts without reference to the water accounts, where there was a similar item. [Mr. Anderson intimated that he was aware of that.] An arrangement was made some years since, the Chairman added, that, as the dividends rose, the salaries should be increased; and had it not been for the water the salaries would have risen long ago.

The motion was unanimously carried.

Dividends were next declared at the rates of 9 per cent. per annum on the "A" and "C" stocks, 8 per cent. on the "B" stock, and £6 6s. per cent. on the "D" capital gas and water stocks.

The retiring Directors (Mr. A. H. Baynes and Dr. J. W. L. Glaisher) and Auditor (Mr. F. Lennard) were re-elected.

On the motion of Mr. Shepherd, seconded by Mr. J. L. Chapman, a vote of thanks was passed to the Chairman and Directors; and similar recognition was also made of the services of the Secretary (Mr. Lass), the Engineer (Mr. T. H. Martin), and the Chief Cashier (Mr. Wright).

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The annual meeting of the Barnsley Gas Company was held yesterday week; Mr. E. G. Lancaster presiding. In moving the adoption of the report, he said the figures in the accounts were more favourable than at first sight appeared. The expenditure for the year had been £859 more, for which they had produced an extra 4¾ million cubic feet of gas. The profit was £8631, against £7545—an increase of £86. They had divided among the customers £1141 in the way of discount, and reduced the price of gas to the out-districts to 3s. 6d. per 1000 cubic feet, representing £350; and the figures showed that the actual increase of profit was £471, which the Directors thought eminently satisfactory. The system of allowing discount for prompt payment had worked satisfactorily; and in future the 5 per cent. would be increased to 7½ per cent., which would make a return to the customers of £1700. After saying they should maintain the maximum dividend of 10 per cent., he said there had been the usual after-dinner speeches vilifying the Company. Orators represented the price of gas at 3s. 4d. per 1000 cubic feet. But the discount took off 2d. per 1000 feet. In future, it would take off 3d.; and the largest consumers obtained their gas as low as 2s. 10d. The allowance to the Corporation last year was £107; and this year it would be £160, or sufficient to light 60 or 70 additional lamps. Referring to the electric light, which the Town Council proposed to introduce, he said a good installation might take away some of the Company's best customers for a while; but it would also relieve them of a large amount of work, which was only like giving 20s. for a sovereign. They had no reason to look on the electric light as an enemy of gas. The Council proposed to spend £20,000; but if the promoters and advocates of the scheme would honestly state what they expected the expenditure would be, they would have to confess that it would be nearer £80,000, against which the town would rise. The electric light and the municipal buildings were both good things in their way; but the Council ought to give the town breathing time until the £250,000 or £300,000 which the Midhope Water-Works would cost began to earn interest. If they did this, they would steady the rate. If they went in for these other projects, they would rush up the rates in a way that would be fatal to the well-being of the town for a time. The report was adopted.

The half-yearly meeting of the Colchester Gas Company was held on the 18th ult.—Mr. C. Coleman presiding. The Directors' report showed that, with the exception of the low price of residuals, the result of the year's working was most satisfactory. There was a steady increase in the manufacture and sale of gas, and a greater demand for cooking and heating stoves and gas-engines. The market for residual products had shown a uniform downward tendency, more especially in the case of sulphate of ammonia; but an improvement in prices had set in. Coke continued a drug in the market, owing principally to the mild winter; and tar remained at a very low price. The Directors recommended the payment of the usual dividends. The revenue account showed expenditure to the amount of £8972; and receipts, £11,128—leaving a balance of £2156. The statement of liabilities and assets indicated assets amounting to £19,314, and a balance of £11,602. The report and accounts having been adopted, it was decided that a dividend at the rate of 10 per cent. per annum, free of income-tax, should be paid upon the old shares for the six months ending Dec. 31, and that a dividend at the rate of 7 per cent. per annum be paid on the new shares.

At the half-yearly meeting of the Cork Gas Company last Tuesday, the Directors presented a report and accounts showing receipts to the amount of £27,595 in the six months ending Dec. 31; £22,305 being for gas supplied for public and private lighting. The total expenditure was £20,118; so that there was a sum of £7477 to go to the profit and loss account. The balance to the credit of this account was £5350; and to pay the usual dividends £302 would, it was stated, have to be taken from the reserve fund. The Resident Engineer (Mr. T. P. Travers, Assoc.M.Inst.C.E.) reported that the buildings, apparatus, and plant generally had been maintained in good working order. The Chairman (Mr. G. Lynch) said the Directors had reduced the price of gas 2d. per 1000 cubic feet, which would be equivalent to a decrease of £1536 on a year's rental; but they hoped it would soon be made up by the increased consumption which usually followed a reduction. He expressed his pleasure in stating that there continued to be a steady increase in the consumption of gas, and also in the number of gas-engines, cooking and heating stoves, and slot meters in use. There had also been a very satisfactory decrease in the amount of unaccounted-for gas, which had been brought down to a figure which it was thought some years ago could never be attained. He concluded by moving the adoption of the report; and the motion was carried unanimously. A dividend at the rate of 8 per cent. per annum was declared.

At the half-yearly general meeting of the Dover Gas Company next Monday, the Directors will present accounts showing a balance of £2862 on the profit and loss account for the six months ending Dec. 31. This will allow of the payment of a dividend at the rate of 7½ per cent. per annum (less income-tax), and leave a surplus of £179. In their report, the Directors say that, owing to the strike in the iron trade, they were unable to bring any part of the new retort-house into use for the past winter. The constant increase which took place in the demand for gas throughout the half year therefore made the prospect of Christmas an anxious one for those concerned in the manufacture; but by the admirable manner in which the works were conducted during the period of greatest consumption, the supply was maintained in its full efficiency. They add that great credit and the best thanks of the proprietors are due to the Resident Engineer (Mr. R. Herring) and the staff under him for this result.

At the meeting of the Elland Gas Company last Friday, the report presented showed a balance of £2979 available for distribution; and the Directors recommended a dividend of 12s. per share for the six months ending Dec. 31—making altogether a dividend at the rate of 12 per cent. per annum. The sale of gas produced £10,737; the consumption having been close upon 90 millions, of which 2,462,000 cubic feet had passed through prepayment meters. The profit was £4292, of which £4053 would be absorbed by the dividend.

The annual report of the Directors of the Ipswich Gas Company, which was noticed in the "Journal" last Tuesday, was presented at a meeting of the shareholders the previous day. In moving its adoption, the Chairman (Mr. G. A. Biddell) made an interesting speech. He said that during the year they had sold 238½ million cubic feet of gas; being an increase of 6·42 per cent. The amount sold represented an average of 9800 cubic feet per ton of coal carbonized; while the make had been 10,444 feet per ton. These were better results than they had had before. The increases had been made up partly by an augmentation in the number of public lamp burners; the total now being 1268 (all incandescents), for which they had received the additional sum of £330. From private consumers they had obtained £1885 more than in 1896; and of this no less than £1195 had come from coin meters—there being now nearly 3000 fixed, or an increase of 413 on the year, and leaving 150 on order. It would be seen that of the increase in receipts for gas, more than half had come from prepayment meters, the total collection from which had been £6057; being nearly 18 per cent. of the total income for gas, and more than 27 per cent. of the whole receipts from private lighting. There were 83 gas-engines in the town—an addition of six in the year. Against the good advance in the income from gas in spite of the mild weather, the total receipts from residuals had been £9488, or £473 less than in the preceding year. The balance, however, enabled the Directors to recommend the payment of full dividends on all classes of stock, and to carry forward £4532. Included in this recommendation were the dividends due on the new issue of stock, which realized upwards of £230 per cent. at the sale. Last year the Company paid no less than £2050 for dock dues; being 1s. 7½d. per ton of coal received. Hitherto they had been allowed a drawback on each ton of coke exported beyond the borough, which, in the aggregate of late years, had amounted to about £300 per annum. The Dock Commissioners had decided no longer to grant this drawback; and they would have to provide for the full amount of dues, coupled, he feared, with an increased price for coals, new contracts for which they were now about considering. A penny per ton on the consumption of coal represented upwards of £100 a year. The dock dues amounted to 2·15d. per 1000 cubic feet of gas sold; and in addition to this high charge, they had to provide between £1300 and £1400 a year for rates, equalling 1·35d. Mr. D. Ford Goddard, in seconding the motion, remarked that perhaps some of the proprietors might feel a little anxious because the Corporation had recently obtained a Provisional Order for the supply of the electric light; but he did not think there was really any cause for anxiety. It would be seen from the report that they were adding to the number of small consumers. It was a matter of congratulation that there had been a great demand for prepayment meters; but it was a matter of regret that they had not been able to comply with this demand as promptly as they could have wished. The motion was adopted; and dividends were declared at the rates of 12, 9½, and 9 per cent. on the various classes of shares. Other formal business having been disposed of, votes of thanks were passed to the Chairman and Directors, and to the Engineer and Secretary (Mr. J. T. Jolliffe).

The revenue of the Leominster Gas Company in the past year amounted to £3939 (£3108 being from the sale of gas); the expenditure, to £3019—leaving a balance of £920. The consumption of gas was 16,081,000 cubic feet, or 916,100 cubic feet more than in 1896. At the

annual general meeting last Thursday, the maximum dividends were declared.

The revenue of the Matlock Gas Company for the past year was £5521, of which £4299 was from the sale of gas; the expenditure was £2984—leaving a balance of £2537. The amount available for distribution was £1447; and at the annual meeting last Friday, the Directors recommended dividends at the rates of 10 and 7 per cent. This would leave £930 to be carried forward. The recommendation was agreed to.

The shareholders of the Mirfield Gas Company held their half-yearly meeting last Thursday, when the Directors reported a profit of £2041; making the amount available for dividend £3725. Dividends at the rates of 10 and 7 per cent. per annum on the old and new shares have been declared. After paying these, £1400 will be carried forward.

At the recent half-yearly meeting of the Peterborough Gas Company, the accounts presented showed a profit of £3076. Adding the £313 brought forward made £3389. After providing for the preference dividend, the payment of the maximum dividends absorbed £2730, and left a balance of £654, out of which £200 was placed to the contingent fund, and the rest carried to the credit of the profit and loss account. The Chairman (Mr. W. Harris) stated that there had been a considerable increase in the consumption of gas and an advance in sulphate of ammonia. He announced the intention of the Directors to make a reduction in the price of gas next quarter. The present charge was 3s. 2d. and 3s.; and they proposed to have one uniform rate of 2s. 11d. per 1000 cubic feet. The concession would reduce their annual income by more than £900. This was a somewhat bold step to take; but they believed they would soon recover lost ground. They were still one of the most highly assessed gas companies in the kingdom; their assessment working out to 2½d. per 1000 cubic feet of gas. Thanks were accorded to the Chairman and Directors, as well as to the Manager and Secretary (Mr. J. Barton), for the satisfactory results they had placed before the proprietors.

At the half-yearly meeting of the Pontefract Gas Company—held under the chairmanship of Alderman J. Taylor—the report showed that the amount available for division among the shareholders was £1320, including £500 from the reserve fund; and dividends at the rates of 10 and 7 per cent. were recommended. The reserve fund now amounts to £2561. The Chairman said the results of the working during the six months had not been so satisfactory as they could have wished, as, after making due allowance for exceptional circumstances, they had not sold the quantity of gas expected. The increase of 336,000 cubic feet in the private consumption had been discounted by a loss of nearly 226,000 feet in the public lighting. There had also been a considerable reduction in the amount realized by the sale of residuals. The sum of £500 had been spent in replacing purifiers; and the capital account stood overdrawn to the extent of £1274. The report was adopted.

The half-yearly general meeting of the Portsea Island Gas Company, was held on the 19th ult.—Sir J. Baker, M.P., in the chair. The report presented was very satisfactory, more especially in view of the fact that in the borough considerable progress has been made with the electric light. The total receipts for the six months ending Dec. 31 were £53,764—an increase of £764 as compared with the corresponding period of 1896; while the expenditure had been reduced from £42,694 to £41,967. There was a balance of £11,796 to carry forward, against £10,306. The total quantity of gas manufactured was an increase of 4½ million cubic feet. The full statutory dividends were declared.

At the half-yearly meeting of the Reading Gas Company last Tuesday, the Directors reported an increase in the quantity of gas sold in the second half of last year, as compared with the corresponding period of 1896; and in order to encourage the use of gas-stoves for cooking purposes, they reduced, during the above-named period, the charges for hire. The total revenue was £29,549; the expenditure, £24,499—leaving a balance of £5050 to go to the profit and loss account. The amount standing to the credit of this account was £17,614; and the Directors recommended the payment of full dividends. After many years' working of the regenerative system in the new retort-house, renewals are required, especially in the carbonizing department; and arrangements have been made for these being carried out. Under the supervision of Mr. E. Baker, Assoc.M.Inst.C.E., 15,693 tons 16 cwt. of coal was carbonized in the past half year; the residuals produced being 15,694 chaldrons of coke, 95 loads of breeze, and 180,742 gallons of tar. The ammoniacal liquor was worked up into 167 tons of sulphate, which was all disposed of. The private consumption of gas within the borough was 152,740,400 cubic feet; outside, 4,901,600 cubic feet. The estimated quantity used for public lighting and under contracts was 10,383,693 cubic feet.

At the half-yearly meeting of the Riddings District Gas Company last Friday, the Directors reported a balance of £1677 on the net revenue account, out of which they recommended a dividend for the half year ending Dec. 31 at the rate of 5 per cent. per annum, less income-tax. The total receipts were £1961; the expenditure was £1257—leaving a balance of £704 to go to the profit and loss account.

In moving the adoption of the report at the last half-yearly meeting of the Salisbury Gas Company, the Chairman (Mr. G. Fullford) remarked that, though there had been no fogs, dark days, or frosts during the past three months, the sales of gas had increased, and the income, on the whole, was more than last year, though the price of gas had been reduced. In response to repeated applications, the Directors had introduced a scale of discounts to large consumers, which they did not at present propose to carry below 100,000 cubic feet per quarter, and which would come into operation on March 31 next. While they had lowered the price, they had kept up the quality of the gas, which was always considerably above the statutory requirements. The report was adopted; and dividends ranging from 5 to 10 per cent. per annum were declared. A vote of thanks having been accorded to the Chairman and Directors, the former recognized the services of the Secretary, the Manager, and the whole of the staff. The Manager (Mr. N. H. Humphrys, Assoc.M. Inst.C.E., F.C.S.) acknowledged the vote, which he said would be greatly appreciated by the staff generally. He quite accepted the fact that the gas industry was entering upon new conditions, and that arrangements which answered well in the past would not do for the future. There was now an inclination to consider improvements; and he confidently believed that the second chapter in their industry would be more extensive and important than the first.

At the recent annual general meeting of the Sleaford (Lincs.) Gas Company, the accounts presented showed that a net sum of £3391 had been received for gas, and that the balance at the close of the past year was £4052. The Directors set aside £500 in reduction of the temporary loan of £1500; and they recommended a dividend at the rate of 7½ per cent., free of income-tax. This was agreed to. The works, under the supervision of Mr. H. Wimhurst, were well maintained.

The shareholders of the Uxbridge and Hillingdon Gas Company held their annual general meeting a few days ago, when the Directors reported that the profit was £2050, and that £2412 was available for distribution. They recommended dividends at the rates of £9, £6 15s., and £6 6s. per cent. per annum, the payment of which would absorb £2317, and leave £95 to be carried forward. The Chairman (Mr. W. Fassnidge), in moving the adoption of the report, said the reduction in price of 4d. and 6d. per 1000 cubic feet in the in and out districts, which the Directors made after the March quarter of 1897, had not, up to the end of the financial year, been the cause of any appreciable extra consumption, which for the past year, as compared with 1896, showed an increase of 2½ million feet. This was attributable entirely to prepayment meters, stoves, and public lighting; the consumers using these meters being customers who did not previously burn gas. He was therefore reluctantly obliged to state that the reduction in price had brought no corresponding advantage to the Company, who, on the other hand, had lost money over it. He referred to the resignation of Mr. Septimus Penny, and to the appointment of Mr. Burch as Manager of the works; and he expressed the hope that the change would be satisfactory alike to the shareholders and consumers. One of the shareholders characterized the balance-sheet as bad; and another said it was the worst that had ever been presented. The proprietors were told that they would never have to suffer any diminution in the dividend by the reduction; and if the Directors had only reduced the price 3d., instead of 4d., the dividend would have been saved. The change would come particularly heavy on those who depended almost for their daily bread upon the dividend. Mr. Jones and Mr. Morris defended the reduction; and eventually the motion was carried.

In moving the adoption of the report, noticed in the "JOURNAL" for the 15th ult., of the Directors of the Weymouth Gas Company, at the recent half-yearly meeting, the Chairman (Mr. R. Thomas) pointed out that the shareholders met for the first time under the new conditions inaugurated by their Bill of last session. Their stock was now consolidated, and as from Jan. 1 last it was all of one class—5 per cent. With regard to the works, they were steadily progressing; and there had been a large increase in the consumption of gas. The Directors were devoting more attention to prepayment meters. He had heard a person who used one of these meters say he had all the light he wanted at a great deal less cost than before. He believed this remark contained the secret of the proper use of gas, because immediate attention was called to its consumption. It was not the wish of the Company to have a heavy gas bill and a discontented customer, as they preferred a contented one rather than a large bill. Alluding to gas cooking-stoves, he said these were of great advantage to the working classes. The Company hoped, as soon as their improved works were in operation, to be able to supply a large demand by going into this business, believing it would be taken advantage of by residents of the town. With regard to the supply of electricity, the shareholders knew that last session the Company put a proviso in their Bill to go to the Board of Trade for a Provisional Order if thought necessary. The reason the Directors put in this clause was because they thought the time had come when those persons who regarded the electric light as a luxury and chose to pay for it should have an opportunity of having it. The Company considered there was great negligence on the part of the town in not having acquired powers to furnish the electric light. The Company had acquired the power, and were of opinion that they could supply the electric light cheaper than anyone else in the place, for the reason that they could locally develop the electrical energy, and thus save a large expense in laying mains. If, however, the Corporation obtained a Provisional Order to supply electricity, as he had no doubt they would, the Company would be happy to render them every assistance towards its development and usefulness. The report was adopted; and the dividends recommended were declared. Thanks were accorded to the Chairman and Directors, as well as to the Manager and Secretary (Mr. J. Lowe) and the other officers.

At the meeting of the Wolverhampton Gas Company last Tuesday, the Chairman (Mr. H. Ward), in moving the adoption of the report, noticed in the "JOURNAL" last week, said that, on the whole, the past half year had not been a very good one, though their position compared well with that of other companies. The fact was due in a great measure to the abnormal temperature which prevailed during the winter months, causing a decrease in the demand for gas. The electric light had robbed them of some useful lamps. The automatic prepayment meters had been increased to about three times the original number; thus absorbing more working capital. On the other hand, the amount derived from them during the winter months had been about £50. This seemed likely to prove a new and important branch of the Company's business. Referring to the retirement of the Engineer (Mr. J. Annan), to which we alluded last week, he said the Company regretted it; but Mr. Annan had for many years given his best attention to their interests, and they felt that he was fully entitled to a pension. The report was adopted. It was stated that the retiring Engineer's pension would be half his present salary; and Mr. Annan said that he was more than satisfied, for the Directors had behaved most generously to him. The dividends recommended having been declared, authority was given to the Directors to issue new ordinary stock to the value of £42,373, and debenture stock to the amount of £34,740 at 3½ per cent. A vote of thanks was passed to the officers, in acknowledging which Mr. Annan said the Company had been a progressive one, having increased 123 per cent.; and during the past year they had done well, all things considered. They had supplied gas during several years at the cheap rate of 2s. 4d. per 1000 cubic feet; but since then they had had to increase it to 2s. 9d. At present it was 2s. 6d.; and he trusted that before long it might be again reduced. He was sorry to retire from active work on behalf of the Company; but, as their Consulting Engineer, he should always take a great interest in the welfare of the undertaking.

Water Companies.

The half-yearly meeting of the Brompton, Chatham, Gillingham, and Rochester Water Company was held on the 10th ult., under the presidency of Mr. J. Baird. The Directors' report for the six months to the

31st of December showed that the gross water-rental reached a total of £10,101; this being a substantial increase over the previous half year. After deducting £1205 for discount to consumers, &c., the balance was sufficient to admit of £500 being carried to the reserve fund. A dividend at the rate of 10 per cent. per annum was declared.

The half-yearly general meeting of the Camborne Water Company was held on the 11th ult.—Mr. W. C. Pendarves in the chair. The Directors reported that there was a disposable balance of £769, out of which they recommended dividends at the rate of 9 per cent. per annum on the "A" shares, and £6 6s. per cent. per annum on the "B" shares. They went on to say that, in consequence of an outbreak of typhoid fever in the district, a Local Government Board Medical Inspector (Dr. R. Bruce Low) visited the works, and recommended piping all the water to the Cargenwyn reservoirs. This was being carried out; and the cost would be met out of the revenue account. The Directors had submitted samples of water from the Boswyn tank and the Cargenwyn reservoir for bacteriological examination to the Clinical Research Association of London, and were pleased to say that their report was very satisfactory. The Chairman, in moving the adoption of the report, said the Company were in much the same position as they had occupied for many years. The Directors had recommended a small reduction of 1 per cent. in the dividend on account of the necessity of piping the water. The report stated that, in consequence of the outbreak of typhoid fever, Dr. Bruce Low recommended the piping. But this was not strictly correct, because Dr. Low visited, with himself and other Directors, the stream which supplied the reservoir, and saw that they were piping it. They had arranged to do so before he came. They felt that there was a small part of the water open to contamination, and that it would be wiser to protect the reservoirs from any possible pollution in the future. The report was adopted.

At the recent annual general meeting of the Consett Water Company, the Chairman (Mr. John Brownless), in dealing with the report and balance-sheet, said the payment of a dividend of 6½ per cent. per annum on the ordinary shares, and 4 per cent. per annum on the preference shares, would absorb £6364, and leave £3969 to be carried forward. The total income for the year amounted to £21,747. The report was adopted, and the dividends recommended were declared. At a special meeting subsequently held, it was decided that, in accordance with the provisions of the Consett Water-Works Act, 1894, and the Acts incorporated therewith, the existing capital of the Company should be increased by the creation and issue of 12,000 £5 preference shares, bearing a fixed dividend at the rate of 4 per cent. per annum.

The report of the East Worcestershire Water Company (which was referred to in the "JOURNAL" for the 15th ult.) was submitted by Lord Windsor at a meeting of the shareholders last Thursday. His Lordship said it was satisfactory to find that the water-rentals continued to increase. In 1890 they amounted to £2259; in 1891, to £2559; and in 1893, to £3910—this being the time when the Company received the benefit of the Droitwich supply. It was gratifying, however, to find that in 1894 there was a further increase to £4063; and that since then the total had risen to £5617. Doubtless they would ultimately reach the maximum supply; but it was satisfactory to know that they had not arrived at that point yet. The surface wells at Bromsgrove and Redditch were being condemned; and the result would be an increase in the number of the Company's customers in those towns. The Directors were pleased to be able to increase their dividend from 3 to 3½ per cent. He also mentioned that the whole of the new 3 per cent. debenture stock (£8000) had been subscribed at par and paid for; and the money had been used in the redemption of the mortgage loans. The report was adopted.

The half-yearly general meeting of the Leatherhead and District Water Company was held on the 18th ult., when the accounts presented showed a total of £1192 available for distribution; and the Directors in their report recommended a dividend at the rate of 4 per cent. per annum. This would absorb £599, and leave £593 to be carried forward. Steady progress has been made by the Company. The report was adopted.

At the recent annual meeting of the Liskeard Water Company a satisfactory report was presented as to the year's business, and the condition of the works. A further dividend was recommended for payment; making with the interim dividend 10 per cent. for the year, and leaving a balance of £86 to be carried forward. The report was adopted. The meeting formally approved of the Bill now being promoted by the Company for the sale of the undertaking to the Corporation as from Dec. 31 next.

The 60th half-yearly meeting of the Luton Water Company was held last Thursday—Mr. B. Seebohm presiding. The report showed that the receipts were £4557, against £4299 in the corresponding period of last year; and the balance carried to net revenue account was £2780, as compared with £2528. The amount available for division was £2080, and £593 was carried forward to the renewal and contingency fund. The Engineer (Mr. Phillips) reported that the condition of the mains, services, &c., had been fully maintained, and that the engines, pumps, &c., were in good working order. The Chairman, in moving the adoption of the report, said the revenue showed a very substantial increase of £250; while the expenditure remained practically the same as before. This was the first time the results of the consolidation of the shares had been stated. The capital was originally £50,000, and had been nominally increased by the Luton Water Act of 1897 to £102,500. Of the £40,000 which they were entitled to issue, and part of which they were authorized to call up at the special meeting last year, they had raised £3000; making the total £105,500. On this amount they paid their maximum dividend of 4 per cent. Also for the first time there had been an indication of the market value of their stock, for the last issue of £3000 was sold at a price which yielded a net premium of £408 15s. 10d. This, he thought, was a most satisfactory figure. The report was adopted.

At the half-yearly meeting of the Maidstone Water Company last Thursday, it was reported that £1651 had been expended by the Directors during the past half year in connection with the late typhoid epidemic, and that there were further accounts to be delivered. This expense having to be met out of the revenue account, no dividend on the ordinary share capital was declared. The whole of the Directors placed their resignations in the hands of the shareholders. Two of them adhered to a wish to retire; but the others were re-elected. The Chairman (Mr. G. Marsham) took the opportunity of expressing the Directors' great regret at the dire calamity which had fallen upon the town. With regard to the recent public inquiry, he said the policy of the Directors had been to give every possible assistance to the Local Government Board; and they awaited with confidence the result of the investigation. A special meeting of the shareholders was afterwards held for the purpose of considering and approving a scheme for obtaining a further supply of water to make up for the deficiency caused by the probable abandonment of the Farleigh springs, and also for discussing the proposal of the Corporation to purchase the Company's undertaking.

The report of the Directors of the Newcastle and Gateshead Water Company which was noticed last Tuesday was presented the same day at the annual meeting of the shareholders. In moving its adoption, the Chairman (Mr. W. D. Cruddas, M.P.) spoke of the improvements that had been made in the works during the year. A new 30-inch pipe from Newburn to Gateshead was almost completed; and within a short time it would be in use. There had been two rivers and one railway to cross during the progress of the work; and it had consequently been one of considerable difficulty. As to the filter-beds at Whittle Dene, they were now entirely ready for use. After a reference to the securing of land at Catcleugh for the purpose of a new reservoir, and which matter had been referred to arbitration, he alluded to the improvements which had been made to prevent waste of water by consumers. The motion was seconded by Sir Andrew Noble, and carried unanimously. It was also agreed to pay the usual dividend on the preference stock, and dividends at the rates of £8 10s. and £5 19s. per cent. per annum on the two classes of ordinary stock—making with the interim dividends £7 15s. and £5 8s. 6d. per cent. for the year. At a special meeting which was subsequently held, the shareholders approved of the Bill which has been promoted to give the Company further capital and other powers.

The annual balance-sheet of the Newmarket Water Company shows that last year's trading produced a net profit of £2283; and the amount brought forward from the previous year made a disposable balance of £2492. The Directors recommended a dividend of 9 per cent.

Presiding at the half-yearly meeting of the South Staffordshire Water Company last Thursday, Mr. Frank James described the report (which was noticed on the 15th ult.) as a most satisfactory one. It would, he said, be seen from the capital account that an expenditure of £18,000 had been incurred. Of this something like £9700 had been devoted to the provision of reservoirs at Barr Beacon and Springsmire, and £6558 to the extension of mains, of which upwards of 17 miles had been laid during the half year, making something like 26 miles during the entire year. There had been a new issue of stock amounting to £40,700, and for this the Company had received a premium of £26,535; so that, while they had to pay 5 per cent. on the £40,700, it really meant that the capital they were expending was raised at £3 0s. 6d. per cent. Turning to the profit and loss account, he pointed out that the engine charges were less by £152 than during the corresponding period of last year, though a larger quantity of water had been pumped. The maintenance of works was the one item which was a little disturbing; the increase having been £1137. This was partly accounted for by the Wood Green engines having been entirely overhauled; and there had been extra boiler repairs, cleansing of reservoirs, and the substitution of larger for smaller mains. It was satisfactory that they had been in the position to transfer £1000 to the depreciation fund, which now stood at a very considerable sum. During the six months an additional 1672 houses had been connected; bringing the total up to 94,853. Sir Henry Wiggin seconded the resolution, which was carried. Resolutions were passed declaring dividends of 5 per cent. on the preference stock, 4 per cent. on the Dudley preference stock, and 6 per cent. on the ordinary shares.

At the recent half-yearly meeting of the Stockport Water Company, the Chairman (Mr. G. H. Hill, M.Inst.C.E.) stated that there had been an increase of £1013 in the receipts, and of £230 in the expenditure, as compared with the corresponding six months of 1896. The result of the past year's working was that after paying interest on debentures amounting to £1146, there was left a sum of £10,167 for distribution among the stockholders. After paying dividends at the rates of 2¼, 2¼, and 6¾ per cent. per annum, a balance of £1276 would be left to be carried forward to next year. He did not think this was too large a balance, especially when they considered that they were largely dependent upon the seasons. All the works were kept in first-class order. The report was adopted, and the dividends recommended were declared.

Mid-Sussex Water Supply.—A Local Government Board inquiry was held last Friday, at Hayward's Heath, by Mr. W. O. E. Meade-King, M.Inst.C.E., into the application of the Cuckfield Rural District Council for sanction to borrow £60,000 for the purchase of the Mid-Sussex Water-Works. Mr. E. Waugh, the Clerk to the Council, formally stated the object of the application; giving statistics as to the population of the district, the outstanding loans of the Council, &c. He said the loan in question was required for fifty years, or longer if the Local Government Board would sanction it. He produced the consent of the Board to the acquisition of the works by the Council; and also the award of Sir George Bruce, who fixed the price at £46,138, the Council to pay all costs. The award did not include a main from Whiteman's Green to Warninglid, or from Balcombe to Ardingly and Hapstead Green. The Engineer's estimates for these extensions were £1368 15s., £3210, and £82 12s. 6d. respectively. There were also others, bringing up the total to £7440. Adding 15 per cent. for contingencies, the amount of the award, and the costs of the arbitration, which could not be put down at less than £5000, the total would be a little over £60,000. A loan for this amount at 3 per cent., repayable in fifty years, would mean an annual payment of £2332, which would require a rate of 1s. 6d. in the pound. From the accounts laid before the Umpire when the award was made, they might expect a revenue of £1100; leaving a deficiency of £1232 to be raised by rate. This would require a rate of 5d. He asked that the longest term practicable should be allowed for repayment of the loan, and also, if possible, that the sinking fund might be suspended for a few years. Mr. Strachan described the works, and said it was estimated that about 80,000 gallons of water per day were now provided. The water went into a filter-bed (which it was now proposed to complete), and then into a covered reservoir, which was water-tight up to 300,000 gallons. The Council wished to supply Ardingly and Warninglid, both of which villages were badly in need of water. There was no opposition to the scheme.

SMETHWICK GAS SUPPLY.

The Annual Accounts of the Gas Department.

The report of the Smethwick Gas Department for the year ended Dec. 31 last has just been issued by the Secretary (Mr. W. J. Sturges). It states that it will be necessary to obtain a further loan of £3000, at an early date, as the expenditure on capital account has now exceeded by £2183, the amount authorized to be borrowed; and provision must be made for further outlay on mains and meters. The total loans outstanding on Dec. 31 amounted to £159,971. The expenditure on capital account during the year was £1459; the aggregate expenditure standing at £171,564—being equal to £8 6s. 2d. per ton of coal carbonized ,against £8 16s. for the preceding year. There was an increase of 19,631,200 cubic feet in the quantity of gas sold in 1897 as compared with the previous year; being equal to 10·06 per cent. The additional income derived from this source was £1411. The number of meters in use on Dec. 31 was 3118—an increase of 97 ordinary and 116 prepayment. The number of prepayment meters at the present time is 550. The amount received from these meters last year was £809; and the quantity of gas paid for thereby was 4,855,300 cubic feet. The amount derived from the sale of residuals did not improve in proportion to the increase in the sale of gas. The total income from all sources amounted to £32,309—an increase of £1469. The aggregate expenditure was £21,284—an increase of £1588. The cost of distribution was £1353—a decrease of £434. The result of the year's transactions was a gross profit of £11,024—a reduction of £118, due to the increased cost of coals, the falling off in residuals, and other causes. After allowing for payments for interest on loans, &c., there remained a net profit of £3037, compared with £3117 for 1896. The Gas Committee have paid to the district fund £1200, and have promised £1000 to the same fund out of the past year's profits. The average price of coal carbonized (including oil) worked out to 12s. 0·895d. per ton, against 11s. 3·746d. for the previous year. There was an increase in the quantity of gas produced per ton of coal, which was 11,053 cubic feet as compared with 10,635 cubic feet in the previous year, due probably to the employment of cannel, of which 766 tons were used. The total quantity of gas sold was 196,939,700 cubic feet; and the amount received for it, £25,885. The receipts for residual products came to £6377. The manufacture of gas cost £17,225; its distribution, £1353; lighting and repairing lamps, £685; rates and taxes, £1313; and management, £681. The bad debts were only £24.

Walsall Corporation Gas Supply.—On the minutes of the Gas Committee coming up for confirmation at the last meeting of the Walsall Town Council, Mr. Brownhill said there had been about £2000 less profit made on the year's working than during the previous twelve months. This was on account of £500 more having been given to the consumers in the way of discount; £650 had been taken from them in the shape of additional rates through the re-assessment of the borough; and the rest was accounted for by the decreased sum received for residuals.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The great hinterland question between the Peebles Gaslight Company and the Peebles Town Council, out of which, in the "JOURNAL" for the 8th ult., I expressed the belief that some entertainment might be got, is likely to fulfil my expectations in a more stern manner than I anticipated. There was then no outward appearance of the cloven foot in the proceedings, which had all the semblance of a negotiation between the parties for the feuing, by the Company, of a piece of burgh land contiguous to their works, and the consolidation of the lands they occupy into one feu. Since then the Council have changed their facing; and the movement is now one directed to the promotion of a transfer of the Company's undertaking to the Corporation. Nothing can be said against such a step, provided it is gone about fairly; but as to this I shall have something to say. In order that your readers may understand the situation perfectly, it will be necessary to explain that the gas-works at Peebles stand upon a point of ground at the junction of the Eddleston Water with the River Tweed. Immediately below where the waters unite, a weir crosses the River Tweed, for the purpose of collecting water for the driving of the Tweedside Mills; and the lade conveying this water to the mill forms the actual south boundary of the works. The north boundary is the Eddleston Water; and the westernmost point of the site just abuts upon the Tweed. On the north side of Eddleston Water is Cuddy Green, which is a commonty. Formerly this Cuddy Green and the land on the gas-works side of the Eddleston were low-lying, with the result that when the water was high it overflowed the banks, and when it receded the banks were left in a dirty condition. This was not creditable to a town which is in reality one of the beauty-spots in the South of Scotland, and more particularly so when the advance in sanitary science was taken into account. Accordingly, in 1877, as borne out by the minutes of the Gas Company (though, very strangely, not by those of the Town Council), the Council approached the Company with a proposal that the latter should "cauld"—that is, in reality, build—both banks of the Eddleston Water, and round the caulding off into the Tweed at both sides of the Eddleston. The Council staked off where the building was to be; and, in strict accordance with engineering science, where it is intended to keep a stream from depositing polluting matter, the channel was narrowed. This had the effect of reclaiming land, part of which had been frequently, and part constantly, under water. It does not appear that there was any arrangement as to who was to own the land; but, seeing that the Company expended £247 upon the improvement, which is at the rate of fully £2000 per acre of the land reclaimed on the gas-works side, and that the town got the benefit of a raised level and a purer stream, there is nothing extravagant in the belief that the intention was that the Company should occupy whatever was reclaimed on their side. At any rate, they have continued to occupy, well knowing that they had no formal title to the reclaimed ground. In 1881, the Company proceeded to build a coal-store on the easternmost end of the reclaimed strip; but they were met by the objection that they were closing up a public footpath.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 485.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 14	10½	Alliance & Dublin 10 p. c.	25—28	..	4 0 9
100,000	10	"	7½	Do. 7 p. c.	16½—17½	..	4 5 8
300,000	100	Jan. 3	5	Australian 5 p. c. Db.	105—107	..	4 13 6
200,000	5	Nov. 11	6½	Bombay, Ltd.	6½—6¾	−¼	4 16 4
40,000	5	"	6½	Do. New, £4 paid	5—5½	..	4 14 6
380,000	Stk.	Feb. 24	12	Brentford Consolidated	295—300*	−5	4 0 0
240,000	"	"	9	Do. New	228—233*	−2	3 17 3
50,000	"	"	5	Do. 5 p. c. Prf.	145—150*	..	3 6 8
159,375	"	Dec. 15	4	Do. 4 p. c. Db. Stk.	134—138	..	2 18 0
220,000	Stk.	Sep. 15	11½	Brighton & Hove Orig.	275—280	..	4 2 3
208,820	"	"	8½	Do. A. Ord. Stk.	200—205	..	4 2 11
933,500	Stk.	Feb. 24	5	Bristol, 5 p. c. max.	130—135*	..	3 14 1
420,000	20	Sep. 30	11½	British	56—57	−½	3 19 0
50,000	10	Aug. 27	11½	Bromley, Ord. 10 p. c.	25—27	..	4 5 2
71,000	10	"	8½	Do. 7 p. c.	20—22	..	3 17 3
500,000	10	Oct. 14	6	Buenos Ayres (New) Ltd	9¾—10¼	..	5 17 1
98,122	Stk.	Dec. 30	4	Do. 4 p. c. Db. Stk.	97—99	..	4 0 10
150,000	20	July 15	8½	Cagliari, Ltd.	30—32	..	5 3 1
100,000	10	Sep. 30	8	Cape Town & Dis., Ltd.	17—18	..	4 8 11
50,000	50	Nov. 2	6	Do. 6 p. c. 1st Mort.	59—61	..	4 18 5
550,000	Stk.	Oct 14	13½	Commercial Old Stock	340—345	..	3 18 3
200,750	"	"	10½	Do. New do.	255—260	..	4 0 9
200,750	"	Dec. 15	4½	Do. 4½ p. c. Db. dc.	154—157	..	2 17 4
800,000	Stk.	Dec. 15	12	Continental Union, Ltd.	247—252	−2	4 15 3
200,000	"	"	9	Do. 7 p. c. Prf.	214—219	..	4 2 2
51,600	Stk	Feb. 24	14	Croydon A 10 p. c.	310—315*	−5	4 8 11
163,400	"	"	11	Do. B 7 p. c.	255—265*	+8	4 3 0
535,000	Stk.	Feb. 24	5½	Crystal Palace Ord. 5 p. c.	134—137*	−2	3 16 8
60,000	"	"	5	Do. 5 p. c. Prf.	140—143*	..	3 9 11
486,090	10	Jan. 27	11	European, Ltd.	25½—26½	..	4 3 0
354,060	10	"	11	Do. £7 10s. paid	18—19	..	4 6 0
5,922,110	Stk.	Feb. 10	12¾	Gaslight & Coke, A, Ord.	296—300	−3	4 5 0
100,000	"	"	4	Do. B, 4 p. c. max.	120—125	..	3 4 0
665,000	"	"	10	Do. C, D, E, 10 p. c. Prf.	317—322	..	3 2 1
90,000	"	"	5	Do. F, 5 p. c. Prf.	150—155	..	3 4 6
60,000	"	"	7½	Do. G, 7½ p. c. do.	220—225	..	3 6 8
1,300,000	"	"	7	Do. H, 7 p. c. max.	200—204	−2	3 8 8
463,000	"	"	10	Do. J, 10 p. c. Prf.	316—321	..	3 2 4
476,000	"	"	6	Do. K, 6 p. c. Prf.	185—190	..	3 3 2
1,061,150	"	Dec. 15	4	Do. 4 p. c. Db. Stk.	137—140	−1	2 17 2
294,850	"	"	4½	Do. 4½ p. c. do.	156—159	..	2 6 7
958,000	"	"	6	Do. 6 p. c. do.	205—210	..	2 17 1
70,000	10	Oct. 28	8	Hongkong & China, Ltd.	14—15	..	5 6 8
3,800,000	Stk.	Nov. 11	10	Imperial Continental	215—220	−3	4 10 11
376,400	100	Feb. 1	4	Do. 4 p. c. Dbs. Red.	98—101	..	3 19 3
473,600	Stk.	Feb. 10	2½	Do. 3½ p. c. Db. Stk.	103—106	+1	3 6 0
					* Ex div.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
75,000	5	Dec. 15	6	Malta & Medn., Ltd.	5½—6	..	5 0 0
560,000	100	Oct. 1	5	Met. of Melbourne 5 p. c. Db.	112—114	..	4 7 8
250,000	100	"	4½	Met. of Melbourne 4½ p. c. Db.	109—111	..	4 1 1
541,920	20	Nov. 11	5	Monte Video, Ltd.	15½—16½	..	6 1 3
150,000	5	Nov. 26	8	Oriental, Ltd.	8—8¼	−¼	4 14 2
135,000	5	"	8	Do. New, £4 10s. pd.	7—7½	..	4 16 0
15,000	5	"	8	Do. do. 1879, £1 pd.	1½—2	..	4 0 0
60,000	5	Sep. 30	7	Ottoman, Ltd.	4⅝—5¼	..	6 13 4
420,000	100	Nov. 2	6	People's Gas of Chicago 1st M. Bd.	104—109	..	5 10 1
500,000	100	Dec. 1	6	People's Gas of Chicago 2nd do.	103—108	..	5 11 1
250,000	10	Sep. 30	10	San Paulo, Ltd.	16—17	..	5 17 3
135,000	Stk.	—	10	Sheffield A.	250—253	..	3 19 0
209,053	"	—	10	Do. B.	250—253	..	3 19 0
447,427	"	—	10	Do. C.	250—253	..	3 19 0
5,475,000	Stk.	Feb. 24	5½	South Metrop., 4 p. c. Ord	144—147*	−2	3 11 5
1,416,667	"	Jan. 13	3	Do. 3 p. c. Db. Stk.	105—108	..	2 15 7
60,000	Stk.	Sep. 15	12	Tottenham and Edmonton A.	285—295	..	4 1 4
60,000	"	"	9	Tottenham and Edmonton B.	205—215	..	4 3 9
182,380	10	Dec. 30	7	Tuscan, Ltd.	13½—14½	..	4 16 7
149,900	10	Jan. 3	5	Do. 5 p. c. Dbs. Red.	100—103	..	4 17 1
				WATER COMPANIES.			
746,164	Stk.	Dec. 30	10½	Chelsea, Ord.	335—340	..	3 1 9
150,000	"	"	5	Do. 5 p. c. Prf.	177—180	..	2 15 6
160,000	"	"	4½	Do. 4½ p. c. Pf. Stk., 1875	157—160	..	2 16 3
175,785	"	Sep. 30	4½	Do. 4½ p. c. 1 b. Stk.	160—165	..	2 14 6
1,720,560	Stk.	Oct. 14	7½	East London, Ord.	232—237	..	3 8 3
654,740	"	Dec. 30	4½	Do. 4½ p. c. Db. Stk.	161—164	−1	2 14 11
390,000	"	"	3	Do. 3 p. c. Db. Stk.	105—107	..	2 16 1
700,000	50	Dec. 15	7½	G'd Junct'n, 10 p. c. max.	123—128	+1	2 18 5
295,000	Stk.	"	4	Do. 4 p. c. Db. Stk.	147—150	..	2 12 8
708,000	Stk.	Feb. 10	13	Kent	358—363	..	3 11 8
160,000	"	"	7	Do. New, 7 p. c. max.	218—218	..	3 4 3
1,043,800	100	Dec. 30	10	Lambeth, 10 p. c. max.	305—310	−2	3 4 6
406,200	100	"	7½	Do. 7½ p. c. max.	230—235	..	3 3 10
350,000	Stk.	Sep. 30	4	Do. 4 p. c. Db. Stk.	147—150	..	2 13 4
500,000	100	Feb. 10	13	New River, New Shares	447—452	..	2 17 6
1,000,000	Stk.	Jan. 27	4	Do. 4 p. c. Db. Stk.	148—153	..	2 12 4
902,300	Stk.	Dec. 15	6	Southw'k & V'xhall, Ord.	166—169	..	3 11 0
126,500	100	"	6	Do. do. 7½ p. c. max.	162—167	..	4 9 10
489,200	Stk.	"	5	Do. do. 5 p. c. Prf.	175—180	..	2 15 6
1,019,585	"	Oct. 14	4	Do. 4 p. c. A Db. Stk.	146—149	..	2 13 8
1,155,066	Stk.	Dec. 15	10	West Middlesex	318—324	..	3 1 7
200,000	"	"	4½	Do. 4½ p. c. Db. Stk.	162—165	−1	2 14 7
					* Ex div.		

An arrangement was then made that they should pay 10s. a year for the privilege of occupying this portion. This sum they have since continued to pay; being at the rate of £14 per acre yearly. The Company now propose to extend their whole works farther eastward, by acquiring land from the town. It was in connection with this proposal that the present question arose. Though the Company came into existence in 1837, the earliest title to the land which they hold is a feu charter granted to trustees for the Company by the Town Council in 1855. This charter, and a plan which accompanied it, were lost; and the documents were only discovered among the papers belonging to the late Secretary of the Gas Company in 1885. Be it observed that the charter had reference to the feu proper of the Company, and had nothing whatever to do with the reclaimed land. Even under the charter, there had been no "infeoffment," which is the formal handing over of a heritable subject; and the deed had never been recorded. The title of the Company has thus all along been in an amazingly unsatisfactory state. This the Company found when they proposed to feu more land. They accordingly sent the charter of 1855 to the Town Clerk, with a view to his preparing articles for the auction of the extended land, and the granting of a new charter for the whole of the lands, new and old, in the possession and occupation of the Company. It was when this charter and plan came into the hands of the Town Clerk that it was discovered the Company were occupying land to which they had no title. The first proposal of the Town Clerk was that the Company should give a formal undertaking that they would remove all their buildings and plant from the ground not contained in the plan. This undertaking was given; it being understood that it was necessary for the purposes of the auction. The Town Council passed resolutions agreeing to the application of the Company; but after receiving the undertaking of the Company to remove their buildings, the Council rescinded the resolutions they had passed. The proposer of the motion was the Treasurer of the burgh (Mr. Williamson); and he very adroitly put as his reason that they might make a new beginning with the negotiations. What this new beginning might be was not indicated further than that "the Council would see what they could do for the inhabitants in connection with a property which had turned out to be of rare value." This was on Jan. 26. As I intimated last week, on Feb. 18, the new beginning was made, by the adoption of a resolution by the Council to the effect that the Gas Company be wound up. Since then circulars have been sent out by both parties—that by the Council asking the shareholders to co-operate with them in the winding up, and that by the Company asking the shareholders to take no action in the meantime.

As I said above, the object of the Town Council is to take over the concern; and the way they are proceeding is to cripple the Company. They propose to disperse the Company; and everybody knows what feeble resistance a dispersed body can give to an organized one. In the event of their not being able to do this, they hold the undertaking that the buildings will be pulled down, which is an ugly thing for the Company. I do not like the method. The Peebles Gas Company have done well by the burgh—in fact, they are a credit to the town. The works are celebrated as being the place where Mr. W. Young set the process of making gas from oil upon a permanent basis. This, of course, is sentiment, and would not count in an arbitration; but there is no denying that the community have been well served by the Company. The further view is also true that the Company have managed their undertaking greatly to the advantage of the people. Had they chosen, they could have made a great deal more out of the works than they have done. Their customary dividend has been 10 per cent. What has been earned over and above this has been either funded (to a small extent) or put into the works; thereby keeping down capital. Now, upon the existing small capital, a 10 per cent. dividend (which is quite maintainable in this instance) would, at 25 years' purchase, work out at £21,000. Will the town be prepared to pay such an amount? Judging by late arbitrations in Scotland, I should say not. Dunfermline was the last one. There the business was five times the amount of what is done in Peebles. The Corporation offered £59,000; and the Arbitrators awarded over £90,000. The one before that was the Falkirk arbitration, where £50,000 was offered, and £77,050 was awarded. I fully expect, from their tactics hitherto, that the Corporation here will also attempt to acquire the undertaking at much less than the actual value. It is the practice of horse-dealers to offer ridiculously small sums when purchasing. It is a pity that it should be so, but it is the case that, in the matter of gas transfers, corporations as a rule emulate the tactics of the horse-dealer. If the Corporation of Peebles wish to come out of these proceedings with credit, they should at once change their policy, and proceed in a natural manner to have the value of the Company's undertaking fixed. It is a pity to see them reversing the policy of trust which was pursued by their predecessors. Should the Corporation persist in their attempts at depreciation, the Company may be obliged to protect themselves by legal means. They have a strong case morally, and shareholders should therefore endeavour to keep their heads cool and wait for developments.

The Edinburgh Town Council have acted in a very scurvy way with incandescent gas lighting in the public streets. They only tried one experiment on a very small scale. The fact is that the subject of public lighting is one that is not much studied in the city, except by Bailie Mackenzie, the Convener of the Electric Lighting Committee. Now the Gas Commissioners have taken the subject up. Their Engineer (Mr. Herring) has returned from his visit of inspection relative to the new gas-works; and he has reported that he was favourably impressed with what he had seen of incandescent gas lighting. Accordingly, at a meeting of the Town Council on Tuesday, a communication was submitted from the Gas Commissioners asking to be allowed to experiment with the lighting of some streets by means of incandescent gas-lamps. The offer was very favourably received, and was, on the suggestion of Lord Provost Mitchell Thomson, sent to the Cleaning and Lighting Committee to arrange with the Gas Commissioners upon.

Petitions against the Bill of the Edinburgh and District Water Trust have been lodged in the House of Lords by the Clippens Oil Company, and Mr. John Gibsone, the proprietor of the estate of Pentland. The petition by the Oil Company is much longer than that of Mr. Gibsone; but his expresses more tersely the view which they both take of the proposals of the Trust. He says: "These proceedings on the part of the Trustees [the litigations with the Oil Company] constituted an illegal

RICHMOND'S

"MOTTO" COMPETITION.

Owing to the large number of Mottoes which have been sent in, it has been found impossible to publish the Awards in this issue.

The Result will be definitely published in the "JOURNAL" on Tuesday, March 15, 1898.

RICHMOND & CO., Ltd.

Gas Stove Manufacturers,

WARRINGTON, STRATFORD, & LONDON.

CITY SHOW-ROOMS: 132, QUEEN VICTORIA STREET, E.C.

attempt to defeat the petitioner's just rights, under the Water-Works Clauses Act, 1847, either to be paid compensation for minerals under and within 40 yards of the Moorfoot aqueduct requiring to be left unworked for its support, or to be allowed, without further interference, and without regard to the safety of the Moorfoot aqueduct, to work those minerals out in the usual course of mining operations. If the Trustees had succeeded in completing the aqueduct and getting it sanctioned by Parliament *ex post facto* (as they now propose to do by the present Bill), before the litigations above referred to were finally concluded in the House of Lords, they would have been in a position to maintain the water supply independently of the Moorfoot aqueduct, and would thus have avoided their duty of maintaining it and of compensating the petitioner for the minerals requiring to be left unworked for its support. The new works are not required in the public interest, but have, on the contrary, been promoted, regardless of cost, for the sole purpose of defeating the rights of the petitioner and his tenants in the minerals under the old pipe-track. The minerals under the roads through which the aqueduct will pass, as well as the minerals under the track where it does not follow the course of the roads, belong to the petitioner (so far as the roads and tracks are on the Pentland Estate). The works will thus impose a new barrier on the petitioner's mineral field; and where not following the course of a road, they will cut up the petitioner's estate, and interfere with the free use of it for agricultural purposes. He objects to his estate being thus intersected by works which are entirely unnecessary, and not required in the public interest."

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 26.

Sulphate of Ammonia.—There has again been a quiet market; and February requirements having been found to be fully covered, there has been a further decline in values. The closing quotation is £9 15s. per ton delivered f.o.b. at the ports. There has been a fair amount of inquiry. But buyers are in no hurry; and only a further substantial reduction would induce extensive purchasing. Second-hand parcels have been more freely offered; and Continental producers have been showing a disposition to meet buyers' ideas. The large home makers have been fully occupied in delivering on contracts, and have not been under the necessity of selling. Other makers have in the main refrained from pressing sales; but lower prices have had to be accepted for such parcels as have been disposed of. Home demand has been moderate; but not sufficient to affect prices. Buyers would be open to entertain business a few months ahead at some discount on spot price; but makers decline to consider it.

Nitrate of Soda is steady at 7s. 6d. per cwt. for fine quality, with a good business doing.

LONDON, *Feb.* 26.

Tar Products.—Business is quiet and uninteresting. The continued deferring of the hope which has been felt all through the winter, that better prices would prevail as the new year grew, has brought the proverbial sickness. Creosote is the only product which shows the least vitality. This is undoubtedly firm and scarce. Carbolic acid is also moving off freely; but the value does not improve. The condition of the market is best measured by the prices at which important contracts have recently been let. The higher prices quoted represent contracts made for tar on which there is little or no carriage to the distiller's works, or where the tar is of exceptional value intrinsically. As has been frequently pointed out before, the more modern modes of carbonizing, and the arrangements in connection with the condensation of the lighter tar products, have had the effect of producing tar, in some instances, that is little better than pitch; and tar in this condition invariably holds large quantities of water, which is costly to separate.

Average market prices may be taken as: Tar, 12s. to 16s. Pitch, east coast, 18s. 6d. to 19s. 6d.; west coast, 15s. 6d. to 16s. 6d. Benzol, 90's, 1s. 3½d.; 50's, 1s. 6d. Tuluol, 2s. Solvent naphtha, 1s. 6½d. Heavy naphtha, 1s. 3d. Crude, 30 per cent., naphtha, 7d. Creosote, 2d.; liquid, 2¼d. Heavy oils, 35s. to 42s. 6d. Carbolic acid, 60's, 2s. Pressed naphthalene, 50s.; salts, 27s. 6d. Anthracene, "A," 5½d.; "B," 4½d.

Sulphate of Ammonia.—The value of sulphate is not maintained. Dealers seem determined to knock down the price, as to-day £9 15s., less 3½ per cent. in all positions, is all that can be obtained. It is stated that a very large business has been booked, but that orders will not be passed on to manufacturers until the fall in the price has ceased. The most encouraging feature about the position is that makers have no stocks, and that the sphere of consumption is much larger than it has ever been in previous years; and, further, that the home consumption is likely to be also much increased this season.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—During the past week, the better qualities of coal have been moving off more briskly for house-fire purposes, and this has helped to clear away stocks under load. Collieries have generally been able to work about full time; but stocks on the pit-banks remain practically untouched, and it is too late in the season for any temporary increased demand to have any appreciable effect. Prices are without quotable change, except that surplus lots have not been pushed for sale at quite such low figures. At the pit mouth, 10s. to 10s. 6d. per ton represents the full average figures for best Wigan Arley; 8s. 6d. to 9s., for Pemberton four-feet and seconds Arley; and about 7s., for common house-fire coal. In other descriptions of fuel the position is much as last reported. Common round coals, though in fairly good demand for steam and forge purposes, continue plentiful; and prices are weak, owing to outside competition. From 6s. to 6s. 6d. per ton at the pit is the average figure for ordinary qualities. For shipment, there has been a fair amount of inquiry; and 8s. to 8s. 3d. per ton is still being obtained for ordinary steam coals, with some collieries quoting 8s. 6d. to 8s. 9d. for better qualities, delivered at the ports on the Mersey. Engine fuel moves off readily. In the open market supplies are ample for requirements; and prices are not more than maintained at about 3s. to

R. & A. MAIN, Ltd.

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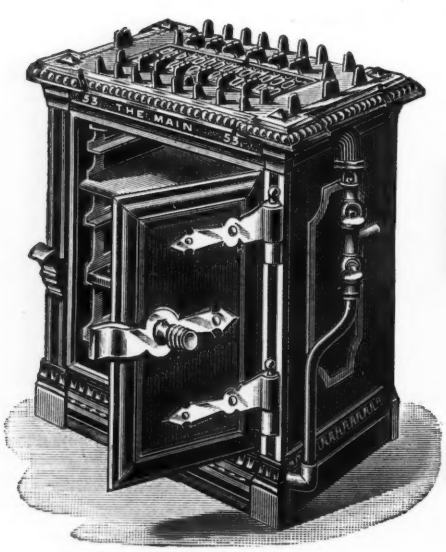
Telegrams: "GASMAIN, GLASGOW."

109, Farringdon Road, LONDON, E.C.
Telegrams: "GASMAIN, LONDON."

BRISTOL:
28, BATH STREET.
Telegraphic Address: "GOTHIC."

BIRMINGHAM:
1, OOZELLS STREET.
Telegraphic Address: "GOTHIC."

MANCHESTER:
37, BLACKFRIARS STREET.
Telegraphic Address: "GOTHIC."



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FULL PARTICULARS TO BE HAD ON APPLICATION.

3s. 6d. per ton at the pit for common, 3s. 9d. to 4s. 3d. for medium, and 4s. 6d. to 5s. for better sorts.

Northern Coal Trade.—There has been a rather sharp falling off in the demand for several kinds of coal, to set against increased consumption of gas and household qualities. Best Northumbrian steam coals are very dull, and have fallen in price to from 7s. 9d. to 8s. per ton f.o.b.; while steam smalls vary from 2s. 9d. to 3s. In manufacturing coals the demand is very steady; most works being now in full operation. Gas coals are in rather better request. No additional contracts of importance are reported this week; but the price for occasional cargoes may be put at from 7s. 6d. to 7s. 9d. per ton f.o.b. It is expected that there will soon be an export of gas coals on some of the settled contracts, so as to take advantage of moderate rates of freight. There is no alteration in the gas coke trade; but the cement factories are taking larger quantities than usual. The price is unaltered this week.

Scotch Coal Trade.—Business, especially in the shipping line, has remained unaccountably slack. Prices are therefore somewhat easier. The most hopeful feature is a better firmness for forward delivery in some instances. The prices quoted are: Main, 6s. 6d. per ton f.o.b. Glasgow; ell, 7s. (easy) to 7s. 3d.; splint, 7s. 3d. to 7s. 6d. The shipments for the week amounted to 118,256 tons—an increase of 9842 tons when compared with the previous week, but a decrease of 10,748 tons on the corresponding period of last year. For the year to date, the total shipments have amounted to 873,621 tons—a decrease on the same period of last year of 10,902 tons.

City of St. Petersburg New Water-Works Company, Limited.—At the meeting of this Company to-day, the Directors will submit a statement of accounts for the year ending Dec. 31, 1897 (O.S.), and a balance-sheet duly audited. After providing for interest on the debenture debt, the net profits are £5353. An interim dividend of 5s. per share was paid in September last. The Directors recommend that a further dividend of 5s. 6d. per share should be paid, £500 placed to the reserve for contingencies, and £290 carried forward. "A" debentures amounting to £7500 were redeemed during the past year; and the rest have been renewed at 4½ per cent. per annum.

Newport (Mon.) Gas-Works Benefit Society.—The 23rd anniversary of the formation of this Society was celebrated on Monday last week by a dinner at the New Bridge Hotel, Newport—Mr. Thomas Canning, Assoc.M.Inst.C.E., J.P., the Engineer and Manager of the Newport Gas Company, presiding. The toast of the evening—"Success to the Newport Gas-Works Benefit Society"—was proposed by Mr. Acland, and acknowledged by the Secretary (Mr. Whitefield). He stated that last year was one of the heaviest they had had for sickness; and yet they had received more donations. Referring to the position of the Society, he said that for the year ending June 30 they had paid to members for funerals and sickness £92, and £12 12s. 5d. to members on leaving the works; being an increase of £34 15s. 5d. over the previous year. They raised their reserve fund from £28 10s. in 1896 to £38 1s. in 1897; collected for the Newport Infirmary £11 13s.; decreased their working expenses from £21 3s. 11d. to £13 15s. 3d.; and paid out, as balance divisible, £36 13s. 6d. in July.

Water Profits and the Relief of the Rates at Hull.—The Hull Corporation Water Committee last Friday considered a request from the Finance Committee for a grant of £4000 in relief of the rates. Considerable discussion took place. Eventually Mr. Scott moved that the grant be made. Alderman Hall proposed as an amendment—"That the Committee cannot see their way to make the grant;" and this was carried by eight votes to three.

Explosion at the Linacre Gas-Works.—During the progress of some repairs to a station meter at the Linacre works of the Liverpool Gas Company a few days since, an explosion occurred which destroyed the meter and did considerable damage to the building containing it, as well as to another meter. Two men were engaged upon the work, but only one was so seriously burnt as to necessitate his detention in the Borough hospital.

The Winding Up of the Billericay Gas-Works.—In the "JOURNAL" for Aug. 31 last, an announcement appeared that Mr. Worthington Church, of the Midland Coal and Cannel Company, had purchased the works of the Billericay Gas Company, and that the winding up of the concern had been entrusted to the Secretary (Mr. J. Paxton Clarkson, F.S.A.A.). We learn that he has paid the debenture-holders and the creditors in full, and has made a final return of 1s. per share to the contributories.

The Aberystwyth Corporation and the Gas Company.—The Aberystwyth Gas Company having been refused a renewal of the lease of their lands at the hands of the Corporation have, as our readers are aware, placed before Parliament a Bill for further powers, and have declined to sell the works to the Corporation. At a recent meeting of the shareholders, the Bill was approved, and the question of making a reduction in the price of the gas was favourably discussed. At present 4s. 8d. per 1000 cubic feet is charged; but a substantial reduction is contemplated. The Council have from the beginning opposed the Company's Bill; and last Friday week they agreed to petition against it. It was also decided to apply to the Local Government Board for sanction to a loan to enable the Corporation to erect gas-works, and to supply gas.

Serious Leakage from a Gas-Main in Birmingham.—Owing to a fracture in a gas-main in Birmingham, due, it is supposed, to the late frost, a large quantity of gas found its way into two houses in Gooch Street, last Wednesday, and was attended with serious, but fortunately not fatal, consequences. The occupants of one of the houses detected unpleasant smells on the previous evening; and the precaution was taken to turn off the gas at the meter. They were nevertheless attacked with vomiting and intense headache. But those in the adjoining premises—a family named Weston, consisting of a man, his wife, and two sons—were overpowered in the night, and their non-appearance in the morning led to an investigation by the police. The premises were entered, and the sufferers promptly removed and treated. The Westons did not use gas; and the pipe into their house was properly capped. Search for the cause of the escape revealed a breakage in the main at a point where the two houses joined. The gas consequently passed through the soil into the cellars of the houses, and thence into the upper part of the premises. The sufferers gradually recovered under the treatment applied.

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The Sheffield Corporation and their Electric Lighting Scheme.—At their meeting last Wednesday, the Sheffield Town Council confirmed certain additional minutes of the Parliamentary Committee, the effect of which was to finally seal the bargain—a rather hard one, as many think—for the acquisition of the undertaking of the Electric Light Company.

Accident to a Holder at the Beverley Gas-Works.—During an exceptionally heavy gale last Wednesday week two of the brackets of a holder, 100 feet in diameter and 17 feet deep, at the Beverley Gas-Works, gave way, and caused the vessel to tilt. It was about 10 feet high at the time. Of course there was a loss of gas; but the Manager (Mr. J. Gibson) was fortunately provided with a good stock in another holder, and so the supply was kept up. A somewhat similar accident occurred to the holder in 1888.

Sales of Shares.—Five lots of shares in the Airdrie Gas Company were recently sold by auction, and realized from £20 to £22 6s. each. At the last sale, an average of £19 16s. 3d. per share was realized. At a sale, lately held in Bedford by Mr. G. C. Walker, nine £50 old shares in the Bedford Gas Company, the last dividend upon which was at the rate of 12 per cent., were offered for competition. The highest price previously obtained for similar shares was at the rate of 229 per cent.; but on this occasion the buyers paid on the average of 244¾ per cent.—the highest price being £122 10s. per share. Messrs. T. Dewhurst and Son recently offered for sale £1100 of "A" stock and £494 of "B" stock of the Preston Gas Company. The former was submitted in eleven lots of £100 each; and, with one exception, they realized £228 each—the odd lot bringing £228 10s. With regard to the "B" stock, the £100 lots fetched £178 10s., £180, and £181; the £94 lot selling *pro ratâ*.

Ottoman Gas Company, Limited.—The report of the Directors of this Company on the past half-year's transactions will be perused with more than ordinary interest by the shareholders. In the first place, it states that the gas-rental for the six months amounted to £9471; and the net profit, to £3292. The sum standing at the credit of the profit and loss account is £4162, out of which the Directors recommend that £2625 shall be distributed in a dividend at the rate of 7 per cent. per annum on both classes of shares, leaving £1537 to be carried forward. The amount charged in the revenue account under the heading of "depreciation, renewals and repairs" includes £726, part of the cost of renewal of one of the gasholders which was seriously damaged during a storm in October last. The Directors have the satisfaction to report that they have concluded with the Imperial Ottoman Government, after much trouble, anxiety, and expense, an "additional convention" for a period of forty years from the termination of that at present existing. Until this arrangement was completed, the Directors delayed the necessary extensions of the works and mains. In order to comply with the terms of the new "convention" and to carry out the extensions and works urgently needed, fresh capital is required. A resolution will therefore be submitted to the shareholders at their coming meeting to authorize the raising of a sum not exceeding £25,000 in debentures, bearing interest at the rate of 5 per cent. per annum. The Directors also announce with regret the retirement from the Board of Mr. A. J. Dove, in consequence of ill-health.

Barry Water Supply.—The Local Government Board have communicated their consent to the Gas and Water Committee of the Barry District Council borrowing £3767 for purposes of water supply.

Gas-Burner Inspection at Blackpool—Acting upon the suggestion of Mr. J. Chew, the Manager of the Blackpool Corporation Gas-Works, the Gas Committee propose adopting a new system which is worth the consideration of the authorities in other towns. Recognizing that many of the complaints as to poor gas come from the use of dirty, faulty, or worn-out burners, Mr. Chew will for the future have a man charged with the special duty of periodically visiting every house where gas is consumed, for the purpose of inspecting the condition of the burners. If defective, he will put on others of regulation size without charge.

Reductions in Price.—The Cork Gas Consumers' Company have reduced the price of gas 2d. per 1000 cubic feet, to take effect for the current half year. The Directors of the East Grinstead Gas and Water Company have decided to reduce the price of gas, after the present quarter, from 4s. 4d. to 4s. 2d., and eventually to 4s. per 1000 cubic feet. The Northwich Gas Company have reduced the price of gas by 3d. per 1000 cubic feet, making the price for lighting 3s. 9d., and for cooking, heating, and motive power 3s. 3d. In order to create a greater demand for prepayment meters, it has been decided to increase the quantity of gas from 15 to 20 cubic feet for 1d. The Chigwell, Loughton, and Woodford Gas Company have decided to reduce the price of gas from 4s. 2d. to 3s. 10d. per 1000 cubic feet, at July next.

Newton-in-Makerfield Water Supply.—At a recent meeting of the Newton-in-Makerfield District Council, the Gas and Water Committee presented a report by the Special Water Committee on a proposed scheme of water supply for the township. On the advice of Mr. D. M. F. Gaskin, M.Inst.C.E., formerly of Nottingham, a suitable site has been selected adjacent to the Wigan and Winwick Railway—a spot recommended by Mr. H. Hill, M.Inst.C.E., as far back as 1870. A trial boring has been carried out, and the yield of water is estimated at about 8000 gallons per hour. Two samples have been analyzed by Dr. J. Campbell Brown, of Liverpool, one of which he has pronounced "excellent," and the other "not bad." The Committee recommended that steps should be taken for proceeding with the scheme on the site selected; and this was agreed to.

Chorley Corporation Gas Supply.—At a meeting of the Chorley Town Council last Thursday, a statement was submitted showing the profits made on the working of the gas undertaking during the past year. It appears that the gas made was 95,309,000 cubic feet, as compared with 88,817,000 cubic feet in the preceding twelve months—an increase of 4,510,000 cubic feet. The quantity of gas sold was 7,734,000 cubic feet more than the previous year; the number of consumers augmented by 740. The income amounted to £17,302, and the expenditure to £10,872; leaving a gross profit of £6430, compared with £5805. After allowing for annuities and other expenses, there was a net profit of £1402. The recommendation of the Committee was that £405 should be paid out as a quarter of the cost of the stoking machinery; the balance of £997 to be used to benefit the rates. These recommendations were approved.

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The above Company have erected during the last four-and-a-half years, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

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	Daily Capacity. Cubic Feet.		Daily Capacity Cubic Feet.
BLACKBURN	1,250,000	SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM	2,000,000	HALIFAX	1,000,000
COLCHESTER	300,000		
BIRKENHEAD	2,250,000		
SWINDON (New Swindon Gas Company)	120,000		

AMERICA.

TORONTO	One New Set.
OTTAWA	One New Set.
TORONTO	(Second Contract) Improving Four Double Superheater Settings.
LINDSAY	Re-modelling Plant.
MONTREAL	Two New Sets and other parts of Plant.
BELLEVILLE	One "Springer" Setting Re-modelled with M-W-P. Patents.
OTTAWA	(Second Contract) One New Set.
BRANTFORD	Additional Improvements to Existing Setting.
ST. CATHERINES	Additional Improvements to Existing Setting.
KINGSTON, PA.	One New Set and other Parts of Works, including New Purifiers and Gasholder.
PETERBOROUGH	One Set and Re-modelling Works.
WILKESBARRE, PA.	Two New Sets and other parts of Plant.
ST. CATHERINES	(Second Contract) One New Set.
BRANTFORD	(Second Contract) One New Gasholder.
BUFFALO, N.Y.	1,500,000 Cubic Feet Daily Capacity.

The Drogheda Corporation and the Gas-Works.—The Drogheda Corporation Gas Committee have agreed to purchase the undertaking of the Drogheda Gas Company for the sum of £21,000; and the Council have approved of their action. Steps are to be taken to have the Company's Bill amended, if necessary.

A Large Reservoir Scheme for the Nile.—The Egyptian Government have just concluded with Messrs. John Aird and Sons a contract for the construction of the long-talked-of Nile reservoirs. The work, which consists of a dam across the Nile at Assuan and another at Assiut, is to be completed in five years, at a total cost, inclusive of interest, of £4,800,000; and the Contractors will accept payment by instalments extending over thirty years, and beginning on the completion of the dams. It is expected that immense benefit will accrue from the scheme; and the Khedive has expressed the greatest pleasure at so important a work being carried out during his reign. According to Reuter, the Contractors have just ordered 3,000,000 barrels of cement in Europe, to be delivered in nine months.

Teignmouth Water Supply.—Tenders for carrying out the proposed works of water supply have been under the consideration of the Teignmouth District Council. In the first place, it was decided to accept the tender of Mr. J. Fisher, of Plymouth, for the whole of the work, at a cost of £6554; but at a subsequent meeting this decision was revoked. Mr. Fisher's tender was accepted for the Landscore reservoir, at the sum of £705; and that of Mr. A. Slocombe, of Teignmouth, for the Hazeldown reservoir, for £5818. Strong remarks were made by members of the Council about this change of front. Mr. F. Slocombe, the Chairman of the Council, said that common sense must be brought to bear in these matters. His brother's tender was recommended for acceptance. The fact that a man occupied a seat on the Council should not be a bar to any relative of his carrying out a contract for the town. It would be an advantage to the working men of the place to have the work entrusted to a local man.

The Surrey County Council and the Southwark and Vauxhall Water Bill.—At the last meeting of the Surrey County Council, Mr. C. Burt, the representative for Surrey on the Thames Conservancy Board, reported on the Bill of the Southwark and Vauxhall Water Company now before the House of Commons, by which they seek power to continue to take an additional quantity of water from the Thames, and construct two large storage reservoirs, of a total capacity of 1200 million gallons. He stated that the Bill was under the careful consideration of the Conservators; and some of its provisions would be strenuously opposed by them. But the construction of additional reservoirs was undoubtedly of great importance, in the interest both of the river and of the consumers. He went on to say: "The volume of the minimum flow of the river at Molesey Weir is of great importance, and may seriously affect the interests of all the riparian owners and occupiers below that point. I understand that from the minimum of 180 million gallons a day at Molesey suggested by the Bill there might be drawn by the several Companies 120 million gallons under their existing powers; leaving in exceptionally dry seasons only 60 million gallons per day actually passing over the Weir. This figure is equivalent to 72 million gallons per day at Teddington Weir, which is about one-half of the volume of the lowest river there for many years. It is obvious that anything like these results would produce very serious injury to the river in Surrey; and I venture to suggest to the General Purposes Committee that they should recommend the Council to take active steps to oppose this part of the Bill in Parliament. The Conservators strongly object to the provisions referred to. They will, I believe, insist that the Southwark and Vauxhall Company be placed under the same conditions in respect of taking water as were imposed on the West Middlesex, Grand Junction, and New River Companies, by the Staines Reservoirs Act, 1896. It was intended by that Act to secure, as far as possible, a minimum flow at Teddington Weir of 200 million gallons per day; and the Southwark and Vauxhall Company's Temporary Act of last session was assented to on those lines." The Parliamentary Committee of the Council were authorized to take the necessary steps to oppose the Bill.

Messrs. W. C. Holmes and Co., of Huddersfield, have received orders from the Perth Commissioners and the Jersey Gas Company for their Patent "New" scrubber-washers, of the vertical type; and from the Barrhead and Nantwich Companies for machines of horizontal form.

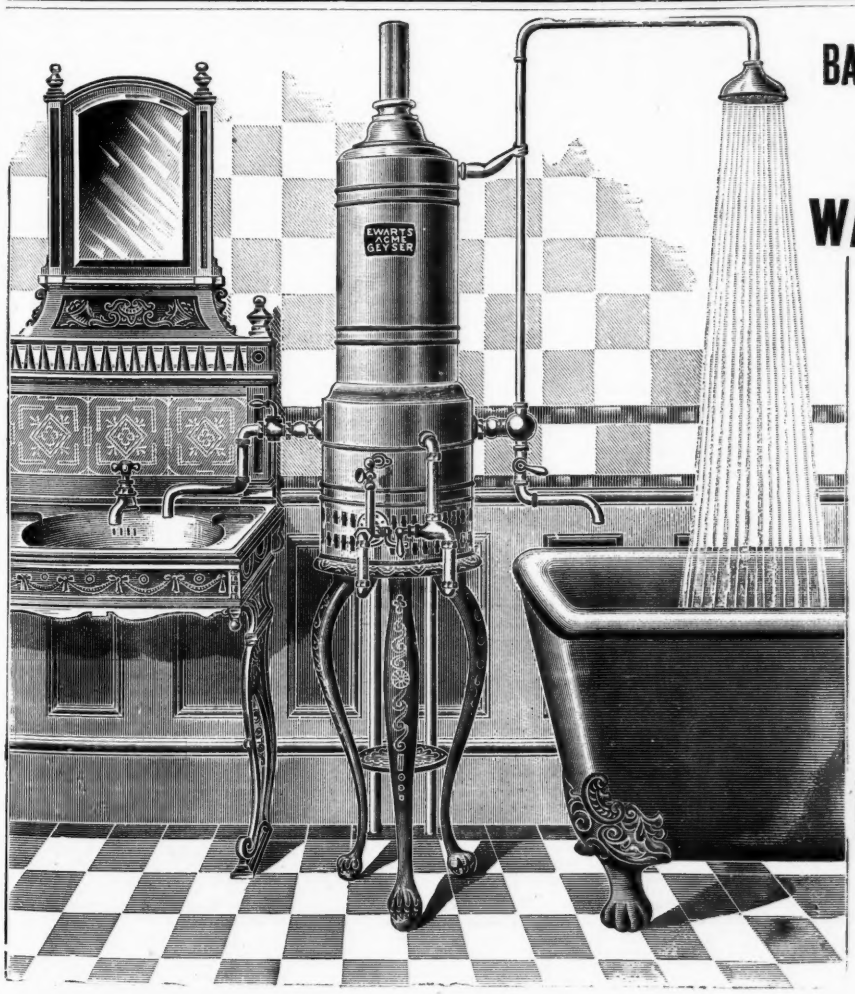
Messrs. C. & W. Walker, of Donnington and London, have received a repeat order from the Glasgow Corporation for two of their 3½-million patent purifying-machines, for erection at the Dawsholm Gas-Works. The Corporation have previously had eight of these appliances erected.

The Works Sub-Committee of the Glasgow Gas Trust have agreed to accept an offer by Sir William Arrol and Co., Limited, to make certain alterations on two charging and two drawing machines at the Tradeston works; and also to fit a hydraulic arrangement for working the scoops of the charging-machines at the Dawsholm works.

The Crystal Palace District Gas Company have accepted the tender of West's Gas Improvement Company, Limited, for installations of their latest compressed air stoking machinery for two of their retort-houses. The Company have also received from the Gas Committee of the Manchester Corporation a large order for coke elevating and screening plant for their Gaythorn station.

Messrs. R. Dempster and Sons, Limited, of Elland, have obtained the contract for the erection of six beds of inclined retorts at the Chesterfield Gas-Works, together with all the accessories, including coal-breakers, elevators, conveyor, and overhead hoppers for the manipulation of the coal. The work will be completed during the summer, ready for being started in the autumn months.

In connection with the Bradford Corporation Gas Department, an exhibition of gas-stoves was opened at the Church Institute last Wednesday by Mr. C. R. Adamson, in the unavoidable absence of the Gas Engineer (Mr. Charles Wood). A great variety of gas-stoves for heating and cooking purposes, manufactured by Messrs. Richmond and Co., were on view; and their ready adaptability for all cooking purposes was very clearly demonstrated by Mrs. J. J. Middleton, who gave lectures on cookery in the afternoon and evening, and was listened to with interest by large audiences.



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They have completed Exhausters to the extent of 36,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

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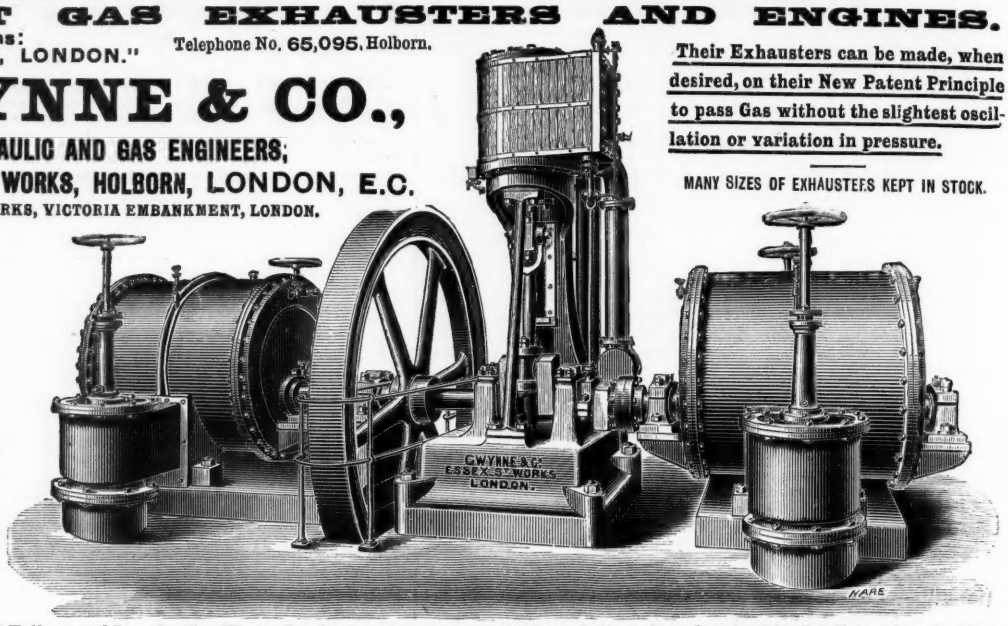

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[For Illustrated Advertisement, see p. 506.]

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BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

TO GAS AND WATER OFFICIALS.

SPECIALLY favourable terms for Cycles.
First-Class Workmanship and Material guaranteed. Art Catalogue post free.
MELROSE CYCLE COMPANY, COVENTRY.

SPENT OXIDE wanted.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, or NEWTON GRANGE, NEWBATTLE, DALKEITH, SCOTLAND.

IMPORTANT.

OLD Retorts made equal to new by repairing them with CROWTHER'S PATENT STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Can be used in Hot or Cold Retorts; and "A1." for Mouthpiece Joints. Satisfaction Guaranteed.
CROWTHER, Practical Retort Setter, Manor Street, HUDDERSFIELD.

SITUATION required as Chief Clerk and Cashier, 21 years with a large Provincial Gas Company. Thoroughly competent to take management of Office and charge of Books. Highest possible References.
Apply, by letter, to No. 3001, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ACETYLENE GAS LIGHTING.

A LARGE newly-established Company would like to enter into COMMERCIAL RELATIONS with trustworthy Manufacturers and Representatives of all Articles appertaining to Acetylene Lighting. Price Lists (illustrated preferred) and Patterns desired.
Offers to Mr. P. OUT, Bookseller, Koog a/d Zoon, HOLLAND. Motto "Acetyleen."

ADVERTISER invites Correspondence with Manufacturers of CHEMICAL MANURES in view of Export Business.
Address No. 3003, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A PROFESSIONAL Gentleman would undertake the SECRETARYSHIP of one or two Country or Foreign Gas or Water Companies, finding Staff and Offices complete in London.
Address Box 135, WILLING'S, 125, STRAND.

HAMBURG Agent for Gas and Electric Illumination, with good connection, is desirous of representing first-class English House. Good References.
Please apply to R. W., care of Paul Conström's Agency, Neuerwall, 40, HAMBURG.

ADVERTISER wants a Situation as MANAGER or UNDER-MANAGER of Gas-Works, either at Home or Abroad. Eleven Years' experience in Portuguese Gas-Works in the above positions. First-class Certificate Honours, Gas Manufacture, 1882.
Address No. 3013, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TWO Stokers Wanted. Wages 30s. and 28s. to commence. Constant Employment to sober, industrious Men.
Address MANAGER, Gas-Works, Woodford Green, ESSEX.

ASCOT DISTRICT GAS COMPANY.

WANTED, at once, two good Stokers used to Shovel Charging.
Apply, with References, to W. G. HICKS, Manager, Gas-Works, Sunninghill, BERKS.

WANTED, a smart, intelligent Young Man as METER READER and OUTDOOR INSPECTOR. None but competent Men need apply.
Apply, by letter, stating Age, Experience, and Salary required, to the MANAGER, Gas-Works, SEVENOAKS.

WANTED, by the Portsea Island Gas-light Company, an ASSISTANT TO THE ENGINEER at the Gas-Works. Age not to exceed 40. He must have experience in the Manufacture of Gas and Manipulation of Regenerating Furnaces and general routine of Gas Production.
Apply, by letter, stating Age, Experience, Salary required, with *copies* of Testimonials, to the SECRETARY, Gas Company, PORTSMOUTH, on or before the 3rd of March next.

WANTED, by the Milnthorpe Gas Com-pany, a thorough, practical WORKING MANAGER able to lay Mains, Services, fix Meters, &c. Will also have to collect Accounts.
Security for £50 required.
Wages 26s. per week, with House, Coal, and Gas.
Applications, with *copies* of three recent Testimonials, which must bear the strictest investigation, to be sent to PHILIP RHEAM, Esq., Secretary, not later than the 7th of March.
Milnthorpe, Westmorland.

ISLE OF THANET GASLIGHT AND COKE COMPANY, MARGATE.

THE Directors of the above Company are prepared to receive APPLICATIONS for the appointment of MANAGER.
The quantity of Coal Carbonized last Year was about 19,000 Tons.
Candidates must possess a thorough knowledge of the Manufacture and Distribution of Gas, in all branches, as also the Manufacture of Sulphate of Ammonia, and the conduct of the ordinary Official Correspondence, &c.
Salary, £250 per annum, with supply of Gas and Coal free.
Applications, in Candidate's own handwriting, stating Age, Experience, &c., and enclosing *copies* of not more than three recent Testimonials (which will not be returned), to be sent to these Offices, addressed to the Chairman, not later than Thursday, the 10th of March next.
For any further Particulars, apply to the Engineer and Manager, Mr. H. H. Jones.
By order,
THOS. C. FULLER,
Secretary.
Company's Offices: The Dane,
Margate, Feb. 25, 1898.

WANTED, four Second-hand Purifiers, 10 ft. by 10 ft. or 12 ft. by 8 ft., with Centre-Valve and Connections, with or without Lifting Gear. Must be in good condition, and the price moderate.
Full Particulars to No. 3012, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

LARGE PURIFIERS WANTED.

WANTED, a second-hand set of Four PURIFIERS in good condition, with Connections complete. Superficial area of each box 500 to 580 square feet, with 18-inch Connections.
Price and full Particulars to No. 2999, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GASHOLDER and Iron Tank, 8500 cubic feet Capacity. Equal to new. Very Cheap.
Address No. 3011, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Round Station Meter, 6-inch Connections, and 6000 Cubic feet per hour. Newly overhauled, and certified correct. A Bargain.
Address No. 3008, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS AND WATER COMPANIES, ENGINEERS, &c.

"WOODITE"—Superior substitute for Rubber, Asbestos, Leather, for Steam and Gas Joints, Rings, Washers, &c.
Write to JAMES READ, 27, Derby Rd., Croydon, SURREY.

PIPE Condensers, eight heights of 6-inch Pipes and bottom Box. £12.
Address No. 3009, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

EIGHTY-LIGHT Dry Gas-Meter, by Alder and Mackay. Nearly new; £5 10s.
J. F. BLAKELEY, Ravensthorpe, YORKS.

GAS-PUMP for Sale, horizontal, one Steam Cylinder, 18-inch bore, and two Gas Cylinders, 17½-inch bore, all 24-inch Stroke, on massive Bed-Plate, with heavy Fly-Wheels. Very strong. First-Class Make. Not much used.
Apply, by letter, to No. 2878, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Exhauster, 20 to 25,000 cubic feet per hour, with Inlet and Outlet Valves and Connections. £30. By Donkin; splendid condition.
Address No. 3010, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Modern Sulphate of AMMONIA STILL, built by Messrs. R. & J. Dempster, Manchester, 1893, with separate Liming Compartment. Capacity, with ordinary Liquor, 5000 to 6000 lbs. of Sulphate per day.
For further Particulars, apply to the BRYMBO STEEL COMPANY, LIMITED, near WREXHAM.

FOR SALE—Two Sets of Iron Mountings complete for Settings of Six 15-inch Circular Retorts. Separate Hydraulic Mains. One 8-inch FOUR-WAY VALVE, by Cockey. Twenty-one WALL BRACKETS, WALL PLATES, and BOLTS for 8-inch Cast-Iron Main.
Apply to H. WIMHURST, Gas-Works, SLEAFORD.

CAMBRIDGE UNIVERSITY AND TOWN GAS-LIGHT COMPANY.

THE above Company will shortly have FOR DISPOSAL two Sets of Three PURIFIERS, 20 ft. by 10 ft. by 4 ft. deep inside, with two Centre-Valves, 14-inch Connections, and Lifting Apparatus complete. All in good condition. The whole can be seen working at the Gas-Works, Cambridge.
By order,
R. BROWN,
Engineer and Manager.

WHITTINGTON GAS COMPANY, LIMITED, NEAR CHESTERFIELD.

FOR SALE—A Vertical Engine and ROTARY EXHAUSTER, separate from each other, with Bye-Pass Valve and sundry Connections. OVERHEAD SHAFTING and GEARING for two Vertical LIQUOR PUMPS, which are also for Sale. All in good order, and can be seen as fixed before removal. Suitable for a works making between 5 and 10 millions a year.
Apply as above.

FOR SALE—A valuable high-class CANNEL COLLIERY, yielding Cannel of about 30-Candle Power, with reserves equal to a duration (at the present output of 1000 Tons per week) of upwards of Fifty Years. The Colliery has paid Dividends exceeding £50,000 over the past Eight Years. It is fitted with most complete and efficient Plant, and is within favourable distance of important Shipping Ports. Principals only need apply.
Address FEATHERSTONE FENWICK, County Chambers, NEWCASTLE-ON-TYNE.

FOR SALE, Cheap—The under- mentioned GAS PLANT:—

	Square.	Deep.		
	Ft. in.	Ft. in.		
2 PURIFIERS,	8 0	4 6	6-in.	Valves & Connections.
1 ,,	7 6	4 6	6 ,,	,, ,,
2 ,,	5 0	4 0	4 ,,	,, ,,
1 ,,	5 0	2 9	4 ,,	,, ,,

C-I. SCRUBBER, 38ft. 6in. high, 6ft. dia., 14-in. ,,
CONDENSER, 4 inches diameter, Vertical Pipes.
EXHAUSTER (Gwynne's) 20,000 c.f. per hour 8-in. Valves
Apply to SAML. WHILE AND SONS, 60, QUEEN VICTORIA STREET, E.C.

COUNTY BOROUGH OF BOLTON.
(GAS DEPARTMENT.)

THE Gas Committee of the above Cor-poration invite TENDERS for the supply, during the Year ending the 31st of March, 1899, of the following Articles, viz:—
LEAD TUBE,
CAST-IRON PIPES,
WROUGHT-IRON TUBING,
GAS-METERS,
SULPHURIC ACID;
Also for the Purchase during the same period of the production of
TAR,
RETORT CARBON.
Further Particulars and Form of Tender for any of the above may be obtained on application to Mr. William Walch, Office Superintendent, Gas Offices, Bolton.
Sealed Tenders, addressed to Alderman Miles, Chairman, and endorsed "Lead Tubing," &c., to be delivered at the Gas Offices, Bolton, not later than Thursday, the 10th day of March.
R. G. HINNELL,
Town Clerk.
Town Hall, Bolton,
Feb. 22, 1898.

ROTHERHAM CORPORATION GAS DEPARTMENT.

FOR SALE—The following second-hand Gas Plant in good condition. No reasonable offer refused.
1 18-inch CENTRE-VALVE, by Newton, Chambers, and Co.
2 TOWER SCRUBBERS.
17 18-inch ROUND MOUTHPIECES.
1 2000 per hour ROTARY EXHAUSTER.
3 18-inch RACK AND PINION VALVES.
7 12-inch RACK AND PINION VALVES.
Full Particulars, &c., from the undersigned.
FRANK A. WINSTANLEY,
Engineer.
Feb. 23, 1898.

URBAN DISTRICT COUNCIL OF PADIHAM.
(GAS DEPARTMENT.)

THE Urban District Council of Padiham invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR to be produced at their Gas-Works during the Year ending March 31, 1899.
Particulars may be had on application to the undersigned.
Tenders, endorsed "Tender for Tar, &c.," and addressed to the Chairman of the Gas Committee, must be sent to me not later than Tuesday, March 8, 1898.
J. R. SMITH,
Clerk to the District Council.
District Council Offices,
Padiham, Feb. 23, 1898.

CORPORATION OF LEICESTER.

TAR STILLS AND CONDENSING WORMS.

THE Gas and Electric Lighting Com-mittee of the above Corporation are prepared to receive TENDERS for the supply and erection, on Foundations provided at their Chemical Works, Aylestone Road, of six TAR STILLS, 12 ft. 6 in. by 10 ft., with CONDENSING WORMS.
Specification and Tracing can be obtained from the Engineer.
Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Stills, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, March 12, 1898.
The Committee do not bind themselves to accept the lowest or any Tender.
ALFRED COLSON, M.Inst.C.E.
Offices: Millstone Lane,
Leicester, Feb. 19, 1898.

BARRY URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for the surplus TAR and all the AMMONIACAL LIQUOR produced at their Gas-Works for One Year ending March 31, 1899. Coal carbonized this year, about 7000 Tons. The Tar and Liquor will be pumped into Contractors' Tank-Trucks at the Gas-Works Siding.
Sealed Tenders, endorsed "Tender for Tar" or "Liquor" as the case may be, or both, stating Price per ton of 20 cwt., to be addressed to the Chairman of the Gas and Water Committee on or before March 14, 1898.
Payments Monthly.
Those tendering for the Liquor to state Price per ounce from 10 to 18 oz. Strength, both inclusive.
Any further Information may be obtained on application to the Engineer and Manager, Mr. F. M. Harris.
The Committee do not bind themselves to accept the highest or any Tender.
Gas and Water Offices,
Barry, Glamorgan,
Feb. 26, 1898.

BARRY URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

TO PIPE FOUNDERS.

THE Gas and Water Committee are prepared to receive TENDERS for the Manufacture and Delivery of the CAST-IRON PIPES and SPECIAL CASTINGS required by the above Department during the Year ending March 31, 1899.
Specification, Form of Tender, and Schedule may be obtained (for the Gas Department) from the Engineer and Manager, Mr. F. M. Harris, and (for the Water Department) from the Water-Works Engineer, Mr. E. W. Waite, at the Gas-Works, Barry, on payment of One Guinea, which will be returned upon receipt of a *bonâ-fide* Tender.
Sealed Tenders, endorsed "Tender for Pipes, &c.," to be addressed to the Chairman of the Gas and Water Committee, on or before March 14 next.
The Committee do not bind themselves to accept the lowest or any Tender.
Gas and Water Offices,
Barry, Glamorgan,
Feb. 26, 1898.

BARRY URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee are prepared to receive TENDERS for the LEAD and COMPO. PIPE, SHEET LEAD, and TIN required by the above Department during the Year ending March 31, 1899.
Any further Particulars may be obtained (for the Gas Department) from the Engineer and Manager, Mr. F. M. Harris, and (for the Water Department) from the Water-Works Engineer, Mr. E. W. Waite, at the Gas-Works, Barry.
Sealed Tenders, endorsed "Tender for Lead and Compo. Pipe, &c." to be addressed to the Chairman of the Gas and Water Committee on or before March 14, 1898.
The Committee do not bind themselves to accept the lowest or any Tender.
Gas and Water Offices,
Barry, Glamorgan,
Feb. 26, 1898.

LEIGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee of the above Council invite TENDERS for SULPHURIC ACID for a period of Twelve Months ending March 31, 1899.

Forms of Tender and further Particulars may be obtained from the Manager, Mr. J. Foster, Gas-Works, Leigh.

Sealed Tenders, endorsed "Tender for Sulphuric Acid," to be sent in to me, the undersigned, on or before Twelve o'clock Noon, on Monday, March 14, 1898.

By order,
PEREGRINE THOMAS,
Clerk to the Council.

Town Hall, Leigh, Lancs.,
Feb. 26, 1898.

GLASGOW CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR CONDENSERS.

THE Corporation of Glasgow invite TENDERS for a Set of CONDENSERS to be erected at their Dawsholm Gas-Works.

Plans may be seen, and Specification and Form of Tender obtained, at the Engineer's Office, 45, John Street, Glasgow.

Sealed Offers, marked "Tender for Condensers," to be addressed to the Subscriber, and lodged with him on or before Tuesday, the 8th of March next.

The Corporation do not bind themselves to accept the lowest or any Tender.

J. D. MARWICK,
Town Clerk.

City Chambers, Glasgow,
Feb. 16, 1898.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
PLYMOUTH AND STONEHOUSE GASLIGHT AND COKE COMPANY.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Monday, March 7, at Two o'clock, in Lots,

£10,000 OF ORDINARY STOCK
OF THE
PLYMOUTH AND STONEHOUSE GASLIGHT AND COKE COMPANY,

Ranking for a Standard Dividend of 5 per cent., subject to the Sliding-Scale; the last Dividend on similar Stock in the Company having been at the rate of 6¼ per cent.

Particulars may be obtained at the COMPANY'S OFFICES, 1, Athenæum Terrace, PLYMOUTH; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.
HAYWARD'S HEATH DISTRICT GAS COMPANY.

NEW ISSUE OF 400 £10 SHARES,

Ranking for a Standard Dividend of 7 per cent.; the last Dividend on similar Shares having been at the rate of £8 1s. per cent.

MR. ALFRED RICHARDS will Sell the above BY AUCTION, at the Mart, E.C., on Monday, March 7, at Two o'clock, in Lots.

Particulars may be obtained of the SECRETARY, at the Company's Offices, 85, GRESHAM STREET, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.
EPSOM AND EWELL GAS COMPANY.

£1500 OF FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the above BY AUCTION, at the Mart, E.C., on Monday, March 7, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
LEA BRIDGE DISTRICT GAS COMPANY.

650 £10 SHARES

Ranking for a Standard Dividend of 7 per cent.

MR. ALFRED RICHARDS will Sell the above BY AUCTION, at the Mart, E.C., on Wednesday, March 16, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

GAS STOCKS.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Monday, March 7, at Two o'clock, in Lots—

WATFORD GAS AND COKE COMPANY—£1790 "C" CAPITAL STOCK.

TAUNTON GASLIGHT AND COKE COMPANY—£500 "A" STOCK & £25 PREFERENCE STOCK.

Particulars of the AUCTIONEER, as above.

THE URBAN DISTRICT COUNCIL OF BUXTON

INVITE Tenders for the supply of a ROTARY EXHAUSTER, to pass 30,000 cubic feet per hour.

Tenders, with Particulars, to be forwarded to the Chairman of the Gas Committee not later than Noon on the 9th of March.

By order,
JOSIAH TAYLOR,
Clerk.

Buxton, Feb. 26, 1898.

EXETER GASLIGHT AND COKE COMPANY.

TENDERS FOR GASHOLDER AND TANK.

THE Directors of the Exeter Gaslight and Coke Company are prepared to receive TENDERS for a THREE-LIFT GASHOLDER and STEEL TANK, to contain nearly 800,000 cubic feet.

Plans and Specifications can be obtained from the undersigned, to whom Tenders should be sent on or before Tuesday, the 8th of March next.

The Directors do not bind themselves to accept the lowest or any Tender.

W. A. PADFIELD,
Engineer.

NORTH MIDDLESEX GAS COMPANY.

55 £10 ORIGINAL 10 PER CENT. SHARES.
78 £10 ORDINARY 7 CENT. SHARES.
MAXIMUM DIVIDENDS ARE PAID.

MESSRS. EDWIN FOX AND BOUS- FIELD will include in their next Stock and Share Auction, at the Mart, on Wednesday, March 9, at Two o'clock, the above.

Particulars at their OFFICE, 99, Gresham Street, LONDON, E.C.

COBHAM GAS COMPANY.

40 £5 SHARES (FULLY PAID).
DIVIDEND 5 PER CENT.

MESSRS. EDWIN FOX AND BOUS- FIELD will include in their next Stock and Share Auction, at the Mart, on Wednesday, March 9, at Two o'clock, the above.

Particulars at their OFFICE, 99, Gresham Street, LONDON, E.C.

WEST KENT GAS COMPANY.

OFFICE: 4, BRIGHTON CHAMBERS, DENMAN STREET, LONDON BRIDGE, S.E.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company, will be held at the Bridge House Hotel, London Bridge, on Monday, the 14th of March, at Three o'clock in the Afternoon precisely, for the purpose of receiving the Directors' Report, and a Statement of the Company's Accounts for the Half Year ended the 31st of December, 1897, to declare a Dividend thereon, to elect Two Directors and One Auditor, and for General Business.

The TRANSFER BOOKS WILL BE CLOSED from the 28th of February until after the Meeting.

By order of the Board,
ROBERT PEAKE KEYS,
Secretary.

Feb. 14, 1898.

OTTOMAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders in the above Company will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, E.C., on Tuesday, March 8, 1898, at One o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st of December last, to declare a Dividend, to elect Directors and Auditors, and to transact the General Business of the Company.

And Notice is Hereby further Given, that a RESOLUTION will be submitted to the Meeting sanctioning the exercise of the BORROWING POWERS of the Company to the extent of £25,000, by way of Mortgage Bond or Debenture, on such Terms and Conditions as the Directors shall think fit.

The TRANSFER BOOKS WILL BE CLOSED from March 1 to 8, both days inclusive.

By order of the Board,
THOMAS GUYATT,
Secretary.

9, Queen Street Place, Cannon Street,
London, E.C., Feb. 22, 1898.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc M.Inst.C.E., F.C.S.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

Ready this Day—450 Pages, Crown 8vo., with numerous Illustrations, 10s. 6d. Leather.

THE

GAS ENGINEER'S POCKET BOOK,

Comprising Tables, Notes, and Memoranda relating to the Manufacture, Distribution, and Use of Coal Gas, and the Construction of Gas-Works.

By HENRY O'CONNOR, Assoc.M.Inst.C.E.

London: CROSBY LOCKWOOD & SON,
7, STATIONERS' HALL COURT, E.C.

GAS PURIFICATION BY
HYDRATED OXIDE.

THIS Material is of full Strength, and Exceptional Activity. It is specially prepared to minimize Back-Pressure; and will be supplied on Hire, or Sold, on the most favourable Terms.

SPENT OXIDES containing Blue, also CRUDE FERRO-CYANIDE PRODUCTS, either PURCHASED or EXCHANGED for FRESH OXIDE.

MANCHESTER OXIDE COMPANY, LTD.,
CANAL ST., MILES PLATTING, MANCHESTER.

ALEXANDER CAMERON,

GAS AND CANNEL COAL MERCHANT,

48, WEST REGENT STREET,

GLASGOW.

ARMSTRONG'S PATENT

CANDLE SAFETY LAMPS.

No. 1. No. 2. No. 3.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

Telephone: Castleford No. 214. | Postal Address: Castleford.
Telegrams: "Silkstone Castleford."

THE SILKSTONE & HAIGH MOOR COLLIERIES, LTD.

ALLERTON BYWATER, CASTLEFORD.

Steam, Manufacturing, & Gas Coals & Cannel.

Analysis, Contracts, Trial Waggons, and Quotations for Large and Small Orders. Inquiries Solicited.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

SANDELL'S

Gas Companies' Account Books.

The Gas Companies' Expenditure Journal.

With Printed Headings and Analyzing Guide, for keeping the Expenditure of Gas Companies upon the easiest and most correct method, and in accordance with the provisions of the Gas-Works Clauses Act of 1871. Size, 16½ in. by 17½ in.

Price: Half-bound, cloth sides, two quires, 36s.; three quires, 45s.

This Book and its predecessor (on the same principle) have been in use since 1867.

The Gas Companies' Rental Book.

A companion Book to above with Printed Headings and Illustration, for keeping the Consumers' Accounts.

Size and Price as above.

The Analyzed Wages Book.

Compiled for use in conjunction with the above Expenditure Journal, with Printed Headings. Size, 15 in. by 10½ in.

Price: Half-bound, cloth sides, two quires, 15s.

Published by
SPOTTISWOODE & Co., 54, Gracechurch Street, E.C., and may also be had from CHARLES SANDELL, 3, Jeffrey's Square, St. Mary Axe, E.C.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON NEWCASTLE."

INCANDESCENT GAS LIGHTING

Has now gained a complete and final **Victory** over its last and greatest Enemy

VIBRATION,

BY MEANS OF
CLAY'S PATENT
SHOCK-PROOF
Incandescent Burner Fittings

Of which full Particulars may be had from

CLAY & WALMSLEY,

BOLTON, ENGLAND.

Telegrams: "CLAYS, BOLTON."

See "JOURNAL OF GAS LIGHTING," July 7, 1896, p. 19, and Dec. 21, 1897, p. 1365.

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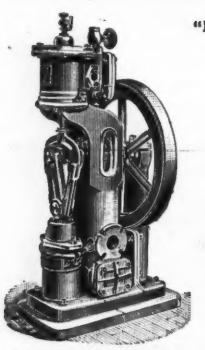
Fig. 705. "SINGLE RAM" STEAM-PUMP.

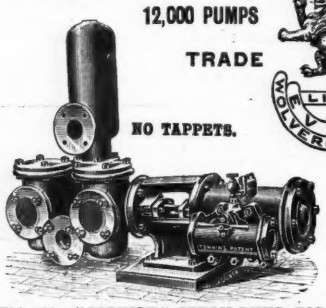
Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

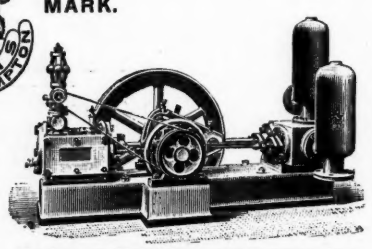
Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

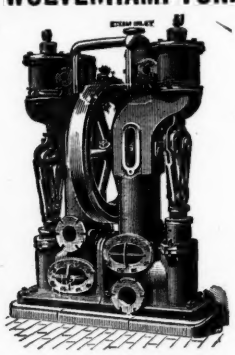
Fig. 712 "DOUBLE-RAM" STEAM-PUMP.

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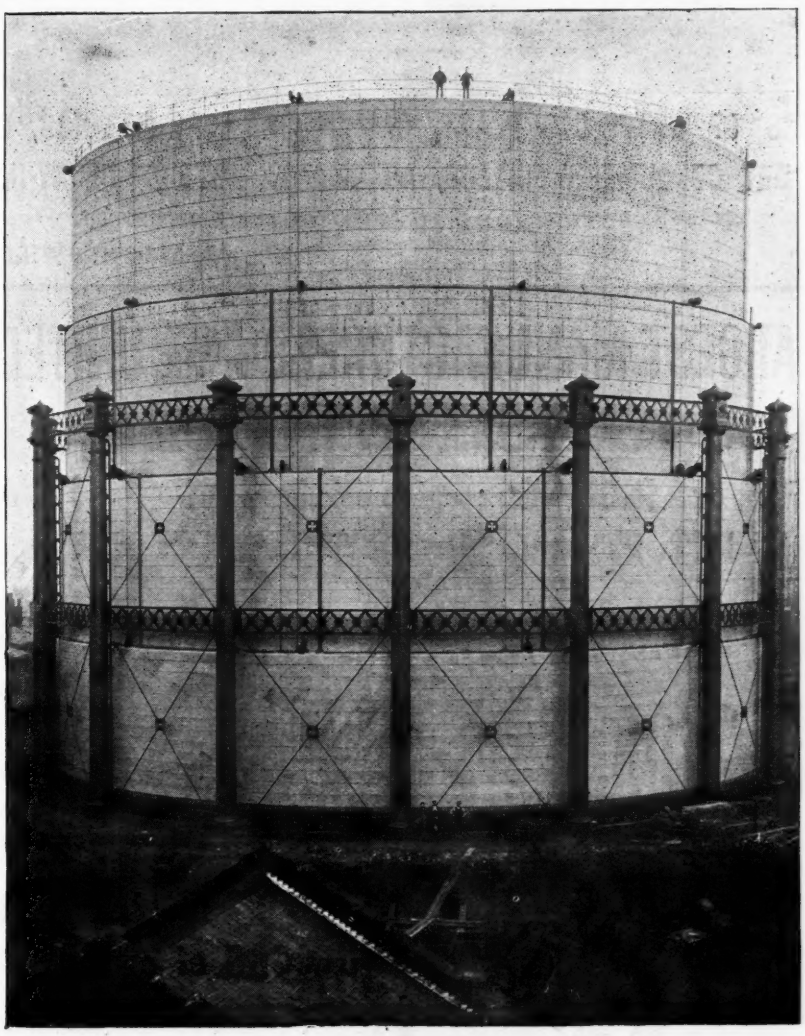

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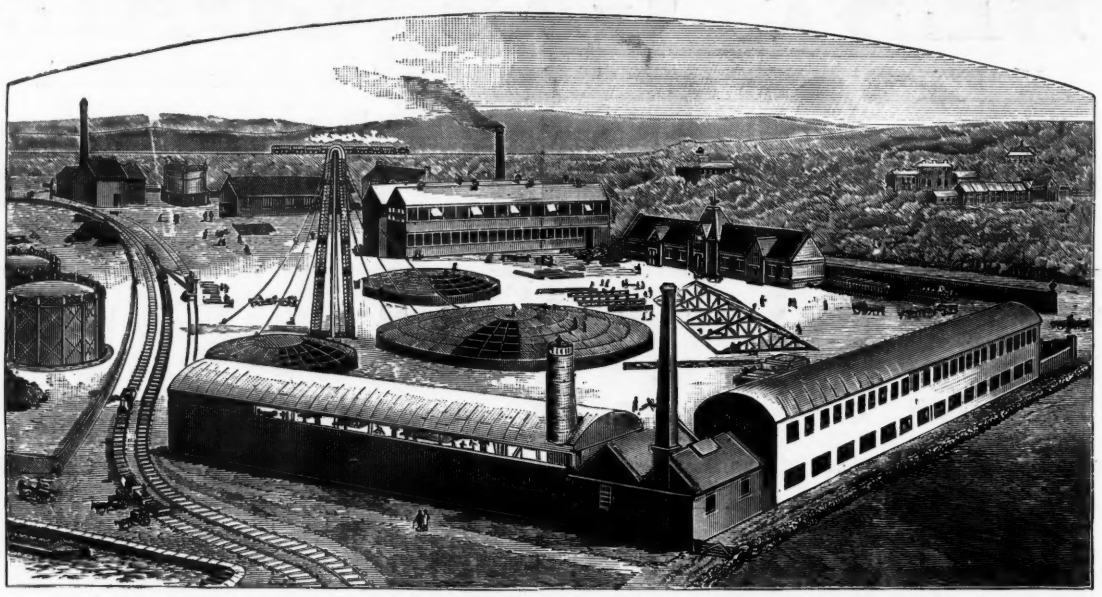

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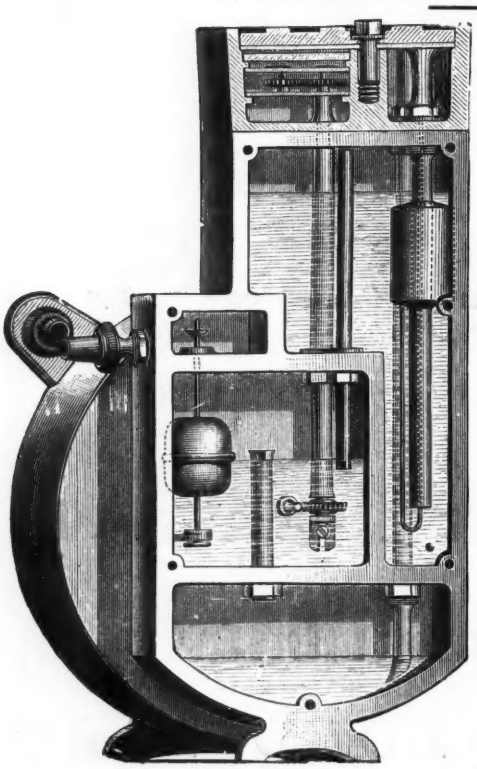

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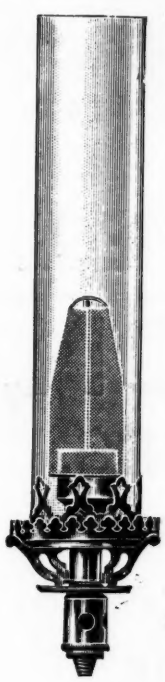

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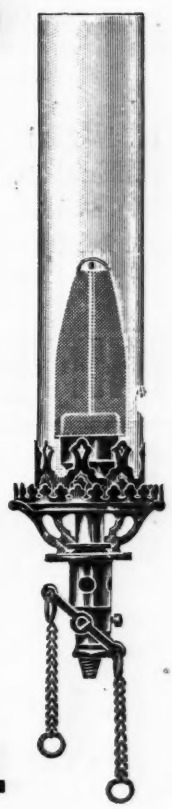

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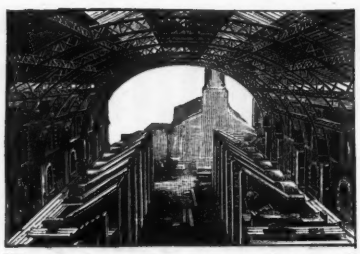

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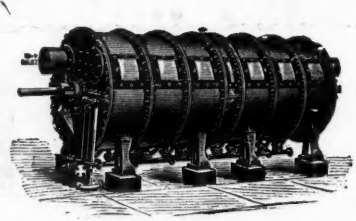

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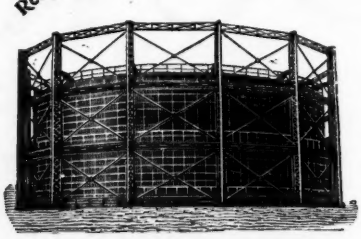

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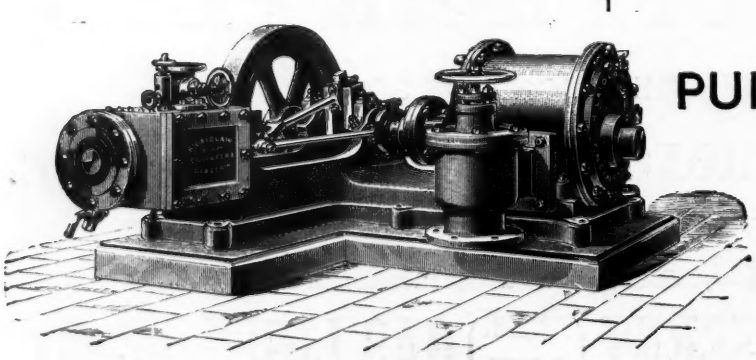

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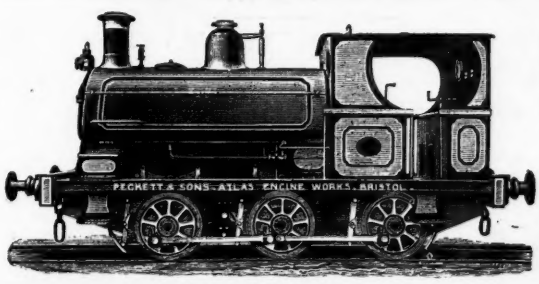

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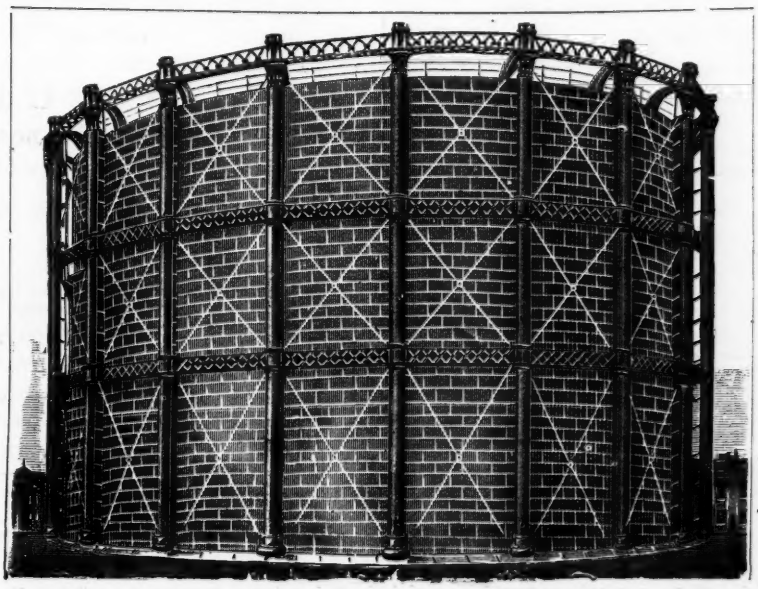

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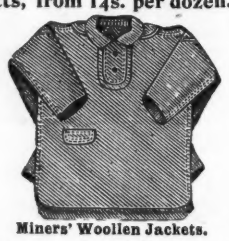

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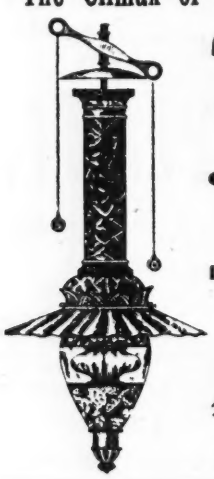

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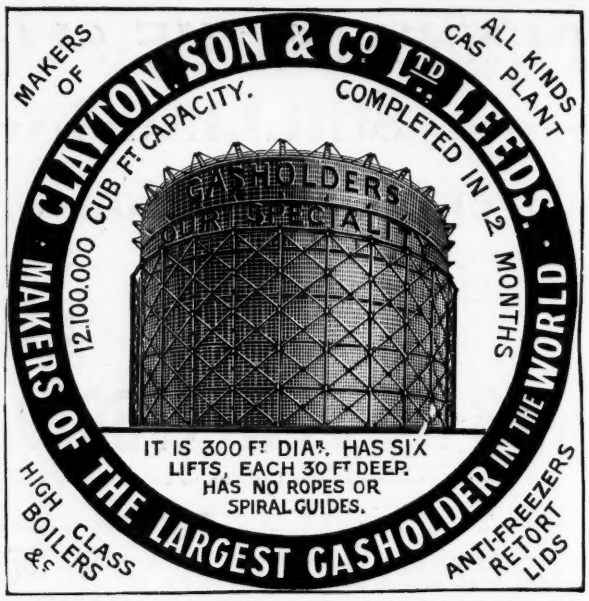
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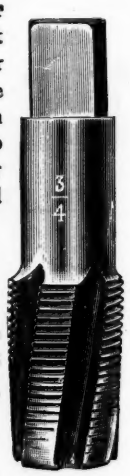

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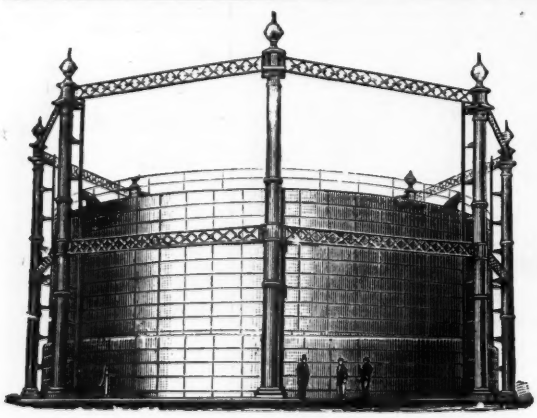

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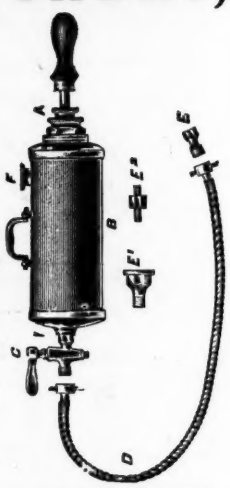

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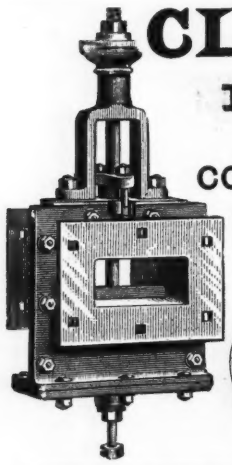

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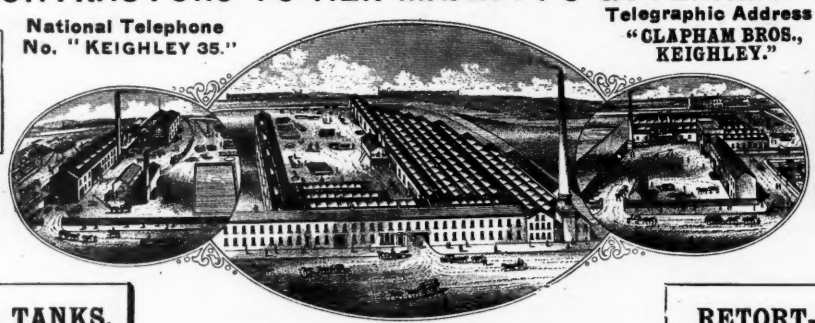

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